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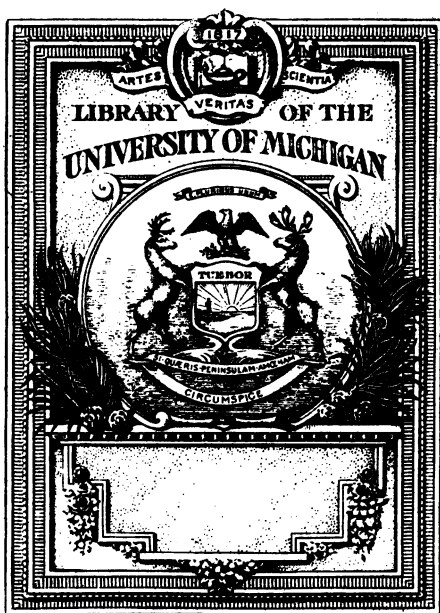
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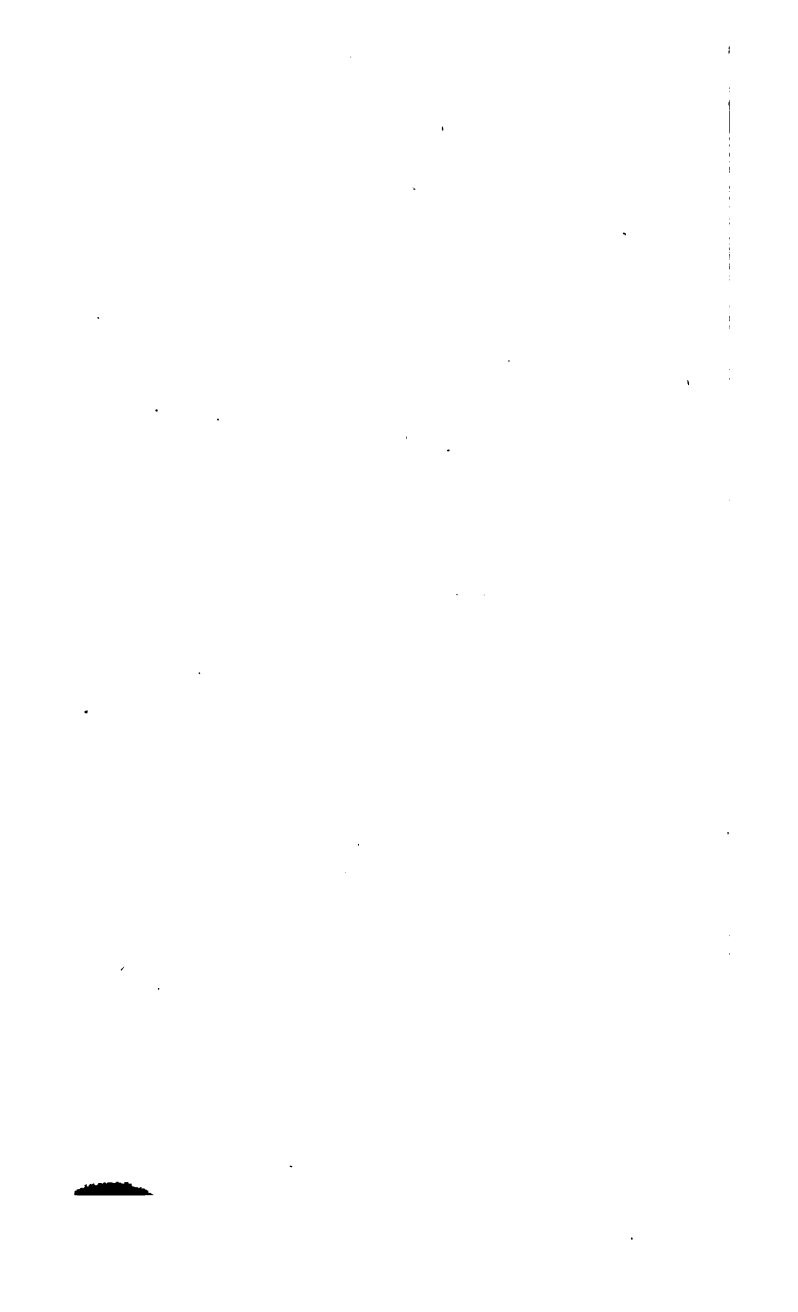
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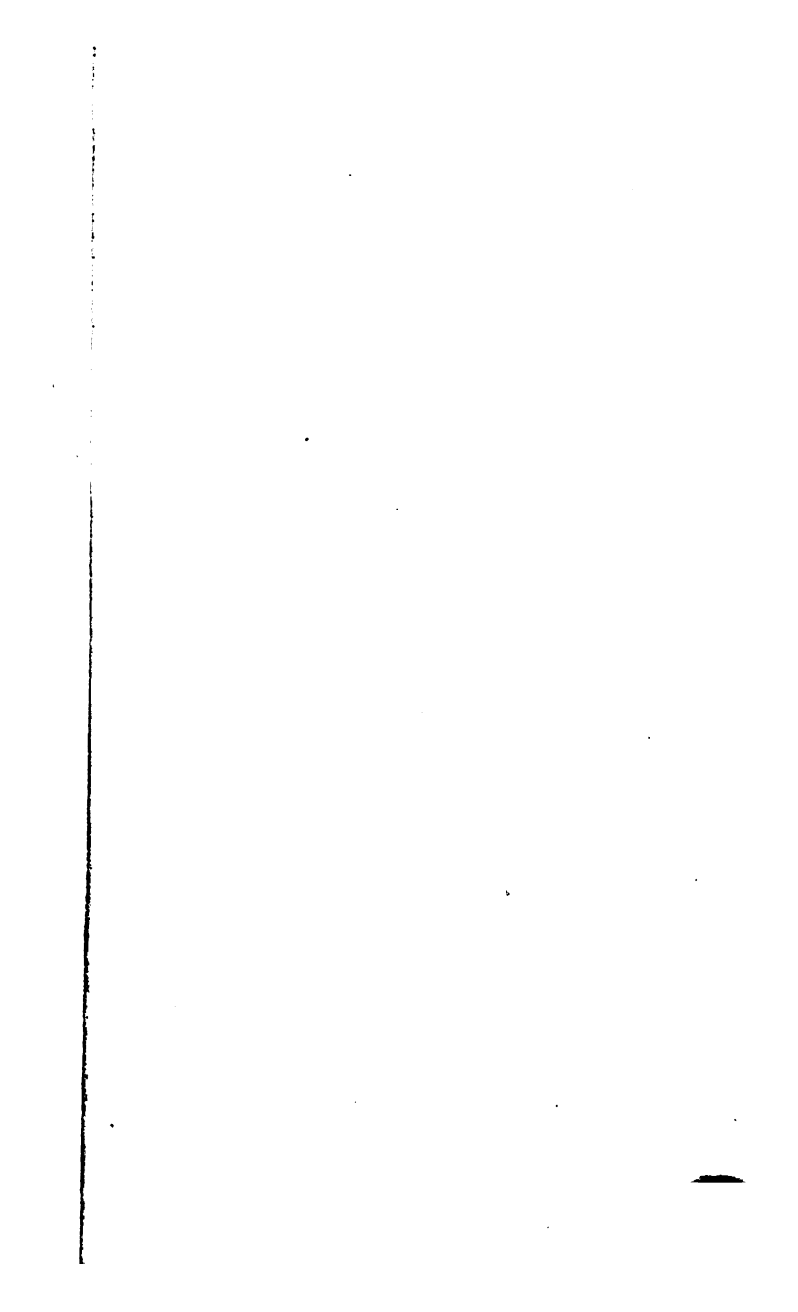
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T H E
L O N D O N
Gentleman's and Schoolmaster's
A S S I S T A N T;

CONTAINING

I. An Easy, and very Comprehensive System of
PRACTICAL ARITHMETIC.

II. Great Variety of Bills of Parcels, Promissory Notes,
and Receipts.

III. An Abstract of Chronology.

IV. An extensive Geographical Table, shewing the direct Dis-
tance, Bearing, and probable Time of Sailing from London, to
the principal Places on the Earth.

V. A Number of original Questions as Exercises.

The Whole designed Chiefly for the Use of Schools.

By THOMAS WHITING,

Writing-Master and Teacher of the Mathematics near
Westminster-Bridge, Lambeth.

L O N D O N:

PRINTED for the AUTHOR and Sold by T. LONGMAN,
PATERNOSTER-ROW.

MDCCLXXXVII.

1787

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YOUNG Gentleman are Boarded, and attentively Taught near Westminster Bridge, Lambeth, English, Writing, Arithmetic, Book-keeping, Geometry, Trigonometry, Mensuration, Navigation, Longitude by Observation, Algebra, Astronomy, &c.

By the AUTHOR and ASSISTANTS.

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P R E F A C E.

ARITHMETIC is a Branch of Knowledge of such universal Importance, that this Treatise, intended to make the full Acquisition of it as easy as possible, will I presume meet with proper Encouragement. The Rules, which throughout the Book, are as short as can be, are delivered, in clear, expressive Terms, so that their Meaning can never be misunderstood. The Examples are of that Kind which must certainly occur in Commerce.

Those Parts of Arithmetic which are the least useful, as Alligation, Double Fellowship, &c. have not many Examples given to them, thinking it very improper to detain the Scholar in Rules of little Consequence. Their Time is employed with much more Propriety in Rules which immediately relate to Business, as the Rule of Three, or Golden Rule, Practice, Loss and Gain, &c. or in acquiring a thorough Knowledge of both Vulgar and Decimal Fractions, Extraction of the Roots, &c. if designed

for any Profession which will make it necessary for them to understand the Mathematics.

The Bills of Parcels are printed in an open, distinct Manner, to induce such as transcribe them, to write these, as well as whatever else they write, neatly and with Clearness.

It is not a Knowledge of Accounts alone that makes a Youth fully qualified for a Mercantile Profession. I have endeavoured to supply what is farther necessary. The Forms of Promissory Notes, and Receipts, are two Articles extremely necessary for young Men in Business to be well acquainted with. A very great Variety of both these, is therefore given. It is frequently of use to a Merchant to know the Time of High-water, at the Place he resides; it is also pleasing to many to be able to determine nearly, the Moon's Age, and Southing. To find the Time of Easter, &c. The Day of the Week corresponding to any given Day of the Month, is very often wanted. For these Reasons I have given an Abstract of Chronology.

Geography is another essential Part of Commercial Education. The very great Use of the extensive Table on that Subject, cannot fail of being exceedingly apparent to every one who observes the important Purposes it is intended for. The Mode of expressing the Situation of Places by their direct Distance and Bearing, conveys a more satisfactory Idea to those who are but little conversant in Geography, than Tables
of

P R E F A C E.

of Latitudes and Longitudes; although these Tables are also of vast Consequence. The Time of Sailing to any particular Place will often be found extremely useful.

The Utility of the Table may be greatly increased by a judicious Teacher, who in pointing out the principal Places, on an artificial Globe, will have an excellent Opportunity of employing his Geographical and Historical Knowledge, to the Advantage of his Scholars. The Latitude and Longitude of the Place; the Situation and Distance from the nearest Places of Note; the Length of the longest and shortest Days; the Government, Produce, and very many other Particulars will occur to an intelligent Preceptor, as absolutely necessary to be well explained to his Scholars, that they may become Men of Business, and Men of rational Conversation: useful to the Community and themselves, and agreeable to their Friends.

The additional Questions, which commence at page 179, and are, as their Title expresses, original Ones, are designed as occasional Exercises.

I shall be very happy, if upon the Whole, this Performance be favoured with Approbation, and be thought as useful in Schools, as I have anxiously endeavoured to make it.

Lambeth,
Aug. 15th, 1787.

THOMAS WHITING.



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T H E
L O N D O N G E N T L E M A N ' s
A N D
S C H O O L M A S T E R ' S A S S I S T A N T .

N U M E R A T I O N

IS the expressing by Figures or Digits, any given Number in Words ; and the reading of any Number that is expressed by Figures is called Numeration.

All Numbers are expressed by one or more of these ten Characters : 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

When two or more of them stand together, the first on the right expresseth so many Units or Ones, the second so many Tens, the Third so many Hundreds, the Fourth so many Thousands, &c.

In general, it is ten Times greater for every Removal from the Place of Unity.

A

The

The following Table will serve as a Specimen for writing Numerically, any Number that can occur in real Use or Curiosity.

[illegible]

Write down in Figures, Twenty four.

24.

Write down in Figures, ^{24.} one Hundred and twenty one.

121.

Write down in Figures, three Thousand, one Hundred and forty four.

3144.

Write down in Figures, seventy one Thousand four Hundred and sixty-nine.

71469.

Write down in Figures, six Hundred Thousand and forty-four.

600044.

Write

Write down in Words at length, the following Numbers, 76, 166, 1786, 71786, 146712, 1234567, 12345678, 123456789.

A D D I T I O N.

BY Addition we are taught to bring two or more Sums into one whole or total Amount.

For instance, if the three Numbers 241, 912 and 129, were given, the Operation whereby their Amount is known, is called Addition.

RULE. Care must be had in placing the Figures in proper Order, i. e. Units under Units, Tens under Tens, &c. then beginning with the first Row of Units, add them up to the Top, set down the Units, and carry One for every Ten to the next, and so on, continuing to the last Row, at which set down the total Amount.

PROOF. Cut off the uppermost Line of Figures, and find the Sum of all the rest, then add this Amount to the Line cut off, and if it be equal to the Sum total, your Work is right.

E X A M P L E.

£	Shillings.	Gallons.	Hogsheads.	Acres.
14	167	1764	14785	714126
16	167	1671	18134	867618
81	184	1717	23456	471867
64	111	4181	81635	456718
11	471	1698	43765	129837
41	684	7146	87654	142536
<hr/>				
227				
<hr/>				

S U B T R A C T I O N.

BY Subtraction we are taught to take a less Number from a greater, and shew the Difference between both. It is of two Sorts, Simple and Compound.

Of SIMPLE SUBTRACTION.

Simple Subtraction teacheth us to find the Difference between any two Numbers that are of the same Signification; as the Difference between 6 and 14 is 8.

RULE 1st. Under the greater Number, write the lesser; so that Units stand under Units, Tens under Tens, &c. and under them draw a Line.

2^d. Beginning at the Right-hand Side, take each Figure in the lower Line from the Figure standing over it, and write the Difference, or what is left, under that Figure.

3^d. If the under Figure be greater than the upper, increase the upper Figure by as many as are in an Unit of the next greater Name; from that Sum, take the Figure standing under it, under which set the Remainder, remembering to carry one to the next under Number.

E X A M P L E.

From 12374

Take 11016

Diff. 1358

Proof 12374

PROOF. Add the two under Lines together, and if their Sum agrees with the top Line, the Work is right.

From 14674

Take 11213

Diff. _____

19145

13130

76100

19129

From

From 186140	80000	10000
Take 118104	71410	1999
Diff. _____	_____	_____

The Number of Examples may easily be enlarged by the Master, according as he thinks proper.

MULTIPLICATION

IS the Method of finding what a given Number will amount to, when repeated as many Times as is represented by another Number.

The Number to be multiplied is called the Multiplicand.

The Number you multiply by is called the Multiplier.

And the Number which arises from the Multiplication, is called the Product.

Multiplication is of two Sorts, Simple and Compound.

Simple Multiplication is the multiplying of any two Numbers together, without having regard to their Signification, as 8 times 11 is 88.

Before you can proceed, the following Table must be perfectly understood.

	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3		9	12	15	18	21	24	27	30	33	36
4			16	20	24	28	32	36	40	44	48
5				25	30	35	40	45	50	55	60
6					36	42	48	54	60	66	72
7						49	56	63	70	77	84
8							64	72	80	88	96
9								81	90	99	108
10									100	110	120
11										121	132
12											144

The London Gentleman's

<i>Multiplicand</i>	674123	167456	112345617
<i>Multiplier</i>	2	3	4
<i>Product</i>	1348246		
874345	567891234	874344876	1234987654
5	6	7	8
101096704	140670456	1067467	14676567
9	10	11	12

When the Multiplier is any greater Number than 12
RULE. Multiply the first Figure of the Multiplier
 into every Figure of the Multiplicand.

By the same Rule, multiply the second Figure of the
 Multiplier into every Figure of the Multiplicand. The
 first Figure of this Line must be placed under the second
 figure of the former Line.

Multiply, by the same Rule, the other Figures of
 the Multiplier, if there are any more, into every Fi-
 gure of the Multiplicand. The first Figure of each Line
 must be placed under the second preceding it, and
 thereby Tens will be under Tens, Hundreds under
 hundreds, &c. For the first Figure of the Multiplier
 being Units, the first Product is Units; the second
 figure of the Multiplier being Tens, the first Product
 is Tens; the third Figure of the Multiplier being
 hundreds, the first Product will be Hundreds, &c.

Add all the Lines together, and the Sum is the
 Product required. Proof by casting out the Nines.

E X A M-

E. X A M P L E.

Multiply 17451
By 346

104706
69804
52353

Product 6038046

Required the Product of 76845 by 146.

Required the Product of 18967656 by 198.

Required the Product of 78901467 by 6789.

Required the Product of 684567816 by 84567.

When there are Cyphers at the right Hand of the Multiplier or Multiplicand, or both, they may be omitted, only multiply the Figures, not regarding the Cyphers until the Work is finished, then the Number of Cyphers contained in both Factors must be added to the right Hand of the Product.

Thus 3000
4000

12000000

I therefore say, three times 4 is 12. I then place the 6 Cyphers to the right Hand of the 12, and the Work is finished.

D I V I S I O N.

BY Division we are taught to discover how often one Number is contained in another, and is a concise Way of performing many Subtractions.

To this Rule belong four principal Parts, viz.

1. The Dividend, or Number to be divided.
2. The Divisor, or Number you divide by.
3. The Quotient, or Answer to the Question, which shews how often the Divisor is contained in the Dividend.
4. The

4. The Remainder, which is always less than the Divisor, and of the same Name or Value as the Dividend. The Remainder is very uncertain, as there is sometimes a very large one, and sometimes none.

There are two Sorts of Division, viz. Simple and Compound.

Simple Division contains two Sorts, viz. Short and Long.

Short Division is when the Divisor does not exceed 12.

When the Divisor is less than 12, find how often it is contained in the first Figure of the Dividend, and if any Thing remains, carry it as so many Tens to the next Figure, and find how often the Divisor is contained therein, set it down, and continue the Operation till all be finished. But if the Divisor be more than 12, multiply it by the Quotient Figure, subtract the Product from the Dividend, and to the right Hand of the Remainder bring down the next Figure, and proceed till all be finished.

PROOF. Multiply the Divisor and Quotient together, and the Remainder add to the Product, that Sum will be equal to the Dividend.

E X A M P L E S.

$$\begin{array}{r} 2)614674 \\ \hline \end{array} \quad \bullet \quad \begin{array}{r} 3)476765676 \\ \hline \end{array} \quad \begin{array}{r} 4)167674160 \\ \hline \end{array}$$

$$\begin{array}{r} 307337 \\ \hline \end{array}$$

$$\begin{array}{r} 5)86367167416 \\ \hline \end{array} \quad \begin{array}{r} 6)176146761 \\ \hline \end{array} \quad \begin{array}{r} 7)18678969 \\ \hline \end{array}$$

$$\begin{array}{r} 8)64915678 \\ \hline \end{array} \quad \begin{array}{r} 9)1416723067 \\ \hline \end{array} \quad \begin{array}{r} 11)16767467 \\ \hline \end{array}$$

$$\begin{array}{r} 12)167846786 \\ \hline \end{array}$$

Of LONG DIVISION.

Long Division is when the Divisor is more than 12 ; for help of the Memory we are obliged to multiply the Quotient Figure and Divisor together, and subtract that Product from the Dividend, in order to find out the Remainder, which Operation must be continued to every Quotient Figure.

E X A M P L E S.

Divisor. Dividend. Quotient.

123) 186786 (1518

123 123

637 4554

615 3036

1518

228

Proof by Multipli-
cation.

123 186786 *Proof.*

1056

984

-72 *Remainder.*

176)189678656(

1489)16765432(

81676)76764678(

96451)176546764671(

74167)1678674676561(

96567)64567865676(

14561(467643219674(

When there are Cyphers placed at the End of the Divisor, cut them off, and the same Number of Places must be cut off in the Dividend.

These Figures which are cut off in the Dividend, must be annexed to the Remainder at last.

E X A M P L E S.

168100)1676465167(761000)46760641111(

5764|0)676946711|6(767|000)111111111111|111(

When the Divisor is such a Number that any two Figures, being multiplied together, will make the said Divisor, it is shorter to divide the given Number by one of those Figures, and that Quotient by the other, as 8 times 9 is 72.

E X A M P L E S.

36)4674(72)786784(81)467645(77)6965643456(

As it sometimes happens that there is a Remainder to each of the Quotients, and neither of them the true one, it may be found by multiplying the first Divisor into the last Remainder, which will give the true one.

M O N E Y.

Marked.

Marked.

$\frac{1}{2}$ Farthing. 4 Farthings make 1 Penny. *d.*

$\frac{1}{2}$ Halfpenny. 12 Pence - 1 Shilling. s.

$\frac{3}{4}$ Three Farthings. 20 Shillings - 1 Pound. £.

Farthings.

4 = 1 Penny.

48 = 12 = 1 Shilling.

960 = 240 = 20 = Pound.

Shillings.

s. £. s.

20 is 1 : 0

30 - 1 : 10

40 - 2 : 0

50 - 2 : 10

60 - 3 : 0

s. f. s.

70 is $\approx 3 : 10$

$$80 - 4 : 0$$

90 - 4 : 10

100 - 5 : 0

PENCE

PENCE TABLE.

<i>s.</i>		<i>d.</i>		<i>d.</i>	<i>s.</i>	<i>d.</i>
20	is	1	:	8	90	is 7 : 6
24	-	2	:	0	96	- 8 : 0
30	-	2	:	6	100	- 8 : 4
36	-	3	:	0	108	- 9 : 0
40	-	3	:	4	110	- 9 : 2
48	-	4	:	0	120	- 10 : 0
50	-	4	:	2	130	- 10 : 10
60	-	5	:	0	132	- 11 : 0
70	-	5	:	10	140	- 11 : 8
72	-	6	:	0	144	- 12 : 0
80	-	6	:	8	150	- 12 : 6
84	-	7	:	0		

TROY WEIGHT.

24 Grains	—	make 1 Pennyweight.	}	<i>Marked.</i>
20 Pennyweights	—	1 Ounce.		<i>grs.</i>
12 Ounces	—	1 Pound.	-	<i>dwt.</i>
				<i>oz.</i>
				<i>lb.</i>
<i>Grains.</i>				
24	=	1 Pennyweight.		
480	=	20 = 1 Ounce.		
5760	=	240 = 12 = 1 Pound.		

By this Weight are weighed Gold, Silver, Jewels, Electuaries, and all Liquors.

N. B. The Standard for Gold Coin is 22 Carats of fine Gold, and 2 Carats of Copper, melted together. For Silver, is 11 *oz.* 2 *dwt.* of fine Silver, and 18 *dwt.* of Copper.

25 *lb.* is a quarter of an *cwt.* 100 *lb.* 1 *cwt.*

20 *cwt.* 1 Ton of Gold or Silver.

A VOIR-

AVOIRDUPOISE WEIGHT.

Marked.

16 Drams	—	make	1 Ounce.	—	}	<i>dr.</i>
16 Ounces	—	—	1 Pound.	—		<i>oz.</i>
28 Pounds	—	—	1 Quarter.	—		<i>lb.</i>
4 Quarters, or 112 lb.			1 Hundred Weight.			<i>qrs.</i>
20 Hundred Weight			1 Ton.	—		<i>cwt.</i>
						<i>Ton.</i>

Drams.

16	=	1 Ounce.			
256	=	16	=	1 Pound.	
7168	=	448	=	28	= 1 Quarter.
28672	=	1792	=	112	= 4 = 1 Hund. Weight.
573440	=	35840	=	2240	= 80 = 20 = 1 Ton.

There are several other Denominations in this Weight, that are used in particular Goods: *viz.*

	<i>lb.</i>		<i>lb.</i>
A Firkin of Butter	- 56	A Stone of Iron Shot,	}
Soap	- 94	or Horseman's wt.	} 14
A Barrel of Anchovies	30	Butcher's Meat	8
Soap	— 256	A Gallon of Train Oil	7½
Raisins	112	A Truss of Straw	- 36
A Puncheon of Prunes	1120	New Hay	60
A Fother of Lead, 19 cwt.		Old Hay	- 56
2 qrs.		36 Trusses a Load.	

Cheese and Butter.

		A Clove, or Half Stone, 8 lb.	
A Wey in Suffolk,	}	<i>lb.</i>	A Wey in Essex,
32 Cloves, or	}	256	42 Cloves, or }
			336

Wool.

Wool.

		lb.		lb.
A Clove	—	7	A Wey is 6 Tod and	} 182
A Stone	—	14	1 Stone, or —	
A Tod	—	28	A Sack is 2 Weys, or	364
			A Last is 12 Sacks, or	4368

By this Weight is weighed any Thing of a coarse or droffy Nature; as all Grocery and Chandlery Wares; Bread, and all Metals but Silver and Gold.

Note. 1 Pound Avoirdupoise is equal to 14 oz. 11 dwts. 15 gr. $\frac{1}{2}$ Troy.

A P O T H E C A R I E S W E I G H T .

Marked.

20 Grains	-	make	1 Scruple	—	} gr. 9
3 Scruples	-	—	1 Dram	—	
8 Drams.	-	—	1 Ounce	—	3
12 Ounces	-	—	1 Pound.	—	16

Grains.

20 =	1 Scruple.
60 =	3 = 1 Dram.
480 =	24 = 8 = 1 Ounce.
5760 =	288 = 96 = 12 = 1 Pound.

Note. The Apothecaries mix their Medicines by this Rule, but buy and sell their Commodities by Avoirdupoise Weight.

The Apothecaries Pound and Ounce, and the Pound and Ounce Troy are the same, only differently divided and subdivided.

CLOTH MEASURE.

Marked.

4 Nails	-	-	make	1 Quarter of a Yard.	$\left. \begin{array}{l} \text{r.} \\ \text{qrs.} \end{array} \right\}$
3 Quarters	-	-	—	1 Flemish Ell	<i>F. E.</i>
4 Quarters	-	-	—	1 Yard	<i>yd.</i>
5 Quarters	-	-	—	1 English Ell	<i>E. E.</i>
6 Quarters	-	-	—	1 French Ell	<i>Fr. E.</i>

Inches.

2 =	1 Nail.
4 =	1 Quarter.
16 =	4 = 1 Yard.
12 =	3 = 1 Flemish Ell.
20 =	5 = 1 English Ell.

LONG MEASURE.

Marked.

3 Barley Corns	-	make	1 Inch	-	-	$\left. \begin{array}{l} \text{bar.} \\ \text{in.} \end{array} \right\}$
12 Inches	-	-	—	1 Foot	-	<i>feet.</i>
3 Feet	-	-	—	1 Yard	-	<i>yd.</i>
6 Feet	-	-	—	1 Fathom	-	<i>fth.</i>
5½ Yards	-	-	—	1 Rod, Pole, or Perch	-	<i>rod. p.</i>
40 Poles	-	-	—	1 Furlong	-	<i>fur.</i>
8 Furlongs	-	-	—	1 Mile	-	<i>mile.</i>
3 Miles	-	-	—	1 League	-	<i>lea.</i>
60 Miles	-	-	—	1 Degree	-	<i>deg.</i>

Barley Corns.

3 =	1 Inch.
36 =	12 = 1 Foot.
108 =	36 = 3 = 1 Yard.
594 =	198 = 16½ = 5½ = 1 Pole.
23760 =	7920 = 660 = 220 = 40 = 1 Furl.
190080 =	63360 = 5280 = 1760 = 320 = 8 = 1 Mile.

N. B.

N. B. A Degree is 69 Miles, 4 Furlongs, nearly, though commonly reckoned but 60 Miles.

This Measure is used to measure Distance of Places, or any Thing else that has Length only.

WINE MEASURE.

Marked.

2 Pints	- -	make	1 Quart	- -	$\left. \begin{array}{l} \text{pt.} \\ \text{qts.} \end{array} \right\}$
4 Quarts	- -	—	1 Gallon	- -	gal.
10 Gallons	- -	—	1 Anker of Brandy	- -	an.
18 Gallons	- -	—	1 Runlet	- -	run.
31 $\frac{1}{2}$ Gallons	- -	—	Half an Hogshead	- -	$\frac{1}{2}$ hhd.
42 Gallons	- -	—	1 Tierce	- -	tierce
63 Gallons	- -	—	1 Hogshead	- -	hhd.
2 Hogsheads	- -	—	1 Pipe, or Butt	- -	P. or Butt.
2 Pipes, or 4 Hogsheads	- -	- -	1 Tun	- -	tun.

Inches.

28 $\frac{7}{8}$	=	1 Pint.
57 $\frac{3}{4}$	=	2 = 1 Quart.
231	=	8 = 4 = 1 Gallon.
9702	=	336 = 168 = 42 = 1 Tierce.
14553	=	504 = 252 = 63 = 1 $\frac{1}{2}$ = 1 Hogshead.
19404	=	672 = 336 = 84 = 2 = 1 $\frac{1}{3}$ = 1 Puncheon.
29106	=	1008 = 504 = 126 = 3 = 2 = 1 $\frac{1}{2}$ = 1 Pipe.
58212	=	2016 = 1008 = 252 = 6 = 4 = 3 = 2 = 1 Tun.

All Brandies, Spirits, Perry, Cyder, Mead, Vinegar, Honey, and Oil, are measured by this Measure, as also Milk; not by Law, but Custom only.

ALE and BEER MEASURE.

				<i>Marked.</i>	
2 Pints	- - -	make	1 Quart	- -	$\left. \begin{matrix} \text{pts.} \\ \text{qts.} \end{matrix} \right\}$
4 Quarts	- - -	—	1 Gallon	- -	<i>gal.</i>
8 Gallons	- -	—	1 Firkin of Ale	- -	<i>A. fir.</i>
9 Gallons	- -	—	1 Firkin of Beer	- -	<i>B. fir.</i>
2 Firkins	- - -	—	1 Kilderkin	—	<i>Kil.</i>
4 Firkins, or 2 Kilderkins	- - -	—	1 Barrel	- - -	<i>Bar.</i>
1 Barrel and $\frac{1}{2}$, or 54 Gal.	- - -	—	1 Hoghead of Beer	- - -	<i>hhd.</i>
2 Barrels	- - -	—	1 Puncheon	- -	<i>pun.</i>
3 Barrels, or 2 Hogheads	- - -	—	1 Butt	- - -	<i>Butt.</i>

B E E R.

Cubic Inches.

$$35\frac{1}{4} = 1 \text{ Pint.}$$

$$70\frac{1}{2} = 2 = 1 \text{ Quart.}$$

$$282 = 8 = 4 = 1 \text{ Gallon.}$$

$$2538 = 72 = 36 = 9 = 1 \text{ Firkin.}$$

$$5076 = 144 = 72 = 18 = 2 = 1 \text{ Kilderkin.}$$

$$10152 = 218 = 144 = 36 = 4 = 2 = 1 \text{ Barrel.}$$

$$15228 = 432 = 216 = 54 = 6 = 3 = 1\frac{1}{2} = 1 \text{ Hoghead.}$$

$$20304 = 576 = 288 = 72 = 8 = 4 = 2 = 1 \text{ Puncheon.}$$

$$30456 = 864 = 432 = 108 = 12 = 6 = 3 = 2 = 1 \text{ Butt.}$$

A L E.

Cubic Inches.

$$35\frac{1}{4} = 1 \text{ Pint.}$$

$$70\frac{1}{2} = 2 = 1 \text{ Quart.}$$

$$282 = 8 = 4 = 1 \text{ Gallon.}$$

$$2256 = 64 = 32 = 8 = 1 \text{ Firkin.}$$

$$4512 = 128 = 64 = 16 = 2 = 1 \text{ Kilderkin.}$$

$$9024 = 256 = 128 = 32 = 4 = 2 = 1 \text{ Barrel.}$$

$$13536 = 384 = 192 = 48 = 6 = 3 = 1\frac{1}{2} = 1 \text{ Hoghead.}$$

In

In *London* they compute but 8 Gallons to the Firkin of Ale, and 32 to the Barrel; but in all other Parts of *England*, for Ale, Strong Beer, and Small, 34 Gallons to the Barrel, and 8 Gallons and $\frac{1}{2}$ to the Firkin.

N. B. A Barrel of Salmon or Eels, is 42 Gallons.
 A Barrel of Herrings, - 32 Gallons.
 A Keg of Sturgeon, - 4 or 5 Gallons.
 A Firkin of Soap, - - - 8 Gallons.

DRY MEASURE.

				Marked.
2 Pints	- - -	make	1 Quart	- - - $\left. \begin{array}{l} \text{pts.} \\ \text{qts.} \end{array} \right\}$
2 Quarts	- - -	—	1 Pottle	- - - pot.
2 Pottles	- - -	—	1 Gallon	- - - gal.
2 Gallons	- - -	—	1 Peck	- - - pk.
4 Pecks	- - -	—	1 Bushel	- - - bu.
2 Bushels	- - -	—	1 Strike	- - - strike.
4 Bushels	- - -	—	1 Coom	- - - coom.
2 Cooms, or 8 Bushels	- - -	—	1 Quarter	- - - qr.
4 Quarters	- - -	—	1 Chaldron	- - - chal.
5 Quarters	- - -	—	1 Wey	- - - wey.
2 Weys	- - -	—	1 Last	- - - last.

In *London* 36 Bushels make a Chaldron.

Solid Inches.

268 $\frac{1}{2}$ = 1 Gallon.
 537 $\frac{1}{2}$ = 2 = 1 Peck.
 2150 $\frac{1}{2}$ = 8 = 4 = 1 Bushel.
 4300 $\frac{1}{2}$ = 16 = 8 = 2 = 1 Strike.
 8601 $\frac{1}{2}$ = 32 = 16 = 4 = 2 = 1 Coom.
 17203 $\frac{1}{2}$ = 64 = 32 = 8 = 4 = 2 = 1 Quarter.
 86106 = 320 = 160 = 40 = 20 = 10 = 5 = 1 Wey.
 172032 = 640 = 320 = 80 = 40 = 20 = 10 = 2 = 1 Last.

The Bushel in Water-Measure is 5 Pecks.

A Score of Coals is 21 Chaldron.

A Sack of Coals is 3 Bushels.

A Chaldron of Coals is 12 Sacks.

A Load of Corn is 5 Bushels.

A Cart Load of Ditto is 40 Bushels.

This Measure is applied to all dry Goods.

The Standard Bushel is 18 Inches and $\frac{1}{2}$ wide, and 8 Inches deep.

T I M E.

							<i>Marked.</i>
60 Seconds	-	-	-	-	make	1 Minute	$\left. \begin{array}{l} \text{sec.} \\ \text{m.} \end{array} \right\}$
60 Minutes	-	-	-	-	—	1 Hour	<i>hour.</i>
24 Hours	-	-	-	-	—	1 Day	<i>day.</i>
7 Days	-	-	-	-	—	1 Week	<i>week.</i>
4 Weeks	-	-	-	-	—	1 Month	<i>mo.</i>
13 Months,	1 Day,	6 Hours				1 Julian Year	<i>yr.</i>

Seconds.

60 = 1 Minute.

3600 = 60 = 1 Hour.

86400 = 1440 = 24 = 1 Day.

604800 = 10080 = 168 = 7 = 1 Week.

2419200 = 40320 = 672 = 28 = 4 = 1 Month.
d. b. w. d.b.

11557600 = 525960 = 8766 = 365.6 = 52.1.6 = 1 Ju. Y.
d. h. m. s.

31556937 = 525948 = 8765 = 365.5.48.57 = 1 Sol. Yr.

To know the Days in each Month, observe

Thirty Days hath September,

April, June, and November :

February hath twenty-eight alone,

All the rest hath thirty-one ;

Except in Leap-Year, and then's the Time,

February's Days are twenty-and-nine.

S Q U A R E

S Q U A R E M E A S U R E .

144 Inches	- - - - -	make 1 Foot.
9 Feet	- - - - -	— 1 Yard.
100 Feet	- - - - -	— 1 Square of Flooring.
272½ Feet	- - - - -	— 1 Rod.
40 Rods	- - - - -	— 1 Rood.
4 Roods, or 160 rods, or 4840 Yards		1 Acre of Land.
640 Acres	- - - - -	— 1 Square Mile.
30 Acres	- - - - -	— 1 Yard of Land.
100 Acres	- - - - -	— 1 Hide of Land.

Inches.

144 =	1 Foot.
1296 =	9 = 1 Yard.
39204 =	272½ = 30½ = 1 Pole.
568160 =	10890 = 1210 = 40 = 1 Rood.
6272640 =	43560 = 4840 = 160 = 4 = 1 Acre.

By this Measure are measured all Things that have Length and Breadth; such as Land, Painting, Plaistering, Flooring, Thatching, Plumbing, Glazing, &c.

S O L I D M E A S U R E .

1728 Inches	-	make 1 Solid Foot.
27 Feet	- - - - -	— 1 Yard, or Load of Earth,

40 Feet of round Timber, }
Or, 40 Feet of hewn Timber, } is 1 Ton or Load.

108 Solid Feet. *i. e.* 12 Feet in length, 3 Feet in breadth, and 3 deep; or, commonly, 14 Feet long, 3 Feet 1 Inch broad, and 3 Feet 1 Inch deep, is a Stack of Wood.

128 Solid Feet, *i. e.* 8 Feet long, 4 Feet broad, and 4 Feet deep, is a Cord of Wood.

By this Measure, are measured all Things that have Length, Breadth and Depth.

ADDITION

ADDITION of MONEY, WEIGHTS, and MEASURES.

RULE. Add the first Row or Denomination together, beginning at the Right Hand; then divide the Sum by as many of the same Denomination, as make one of the next greater, set down the Remainder, and carry the Quotient to the next superior Denomination, and continue the same to the Last, which must be treated as Simple Addition.

M O N E Y.

£	s.	d.
3	1	1
6	6	$4\frac{1}{4}$
7	1	$6\frac{1}{2}$
6	7	4
4	5	$1\frac{1}{2}$
7	1	$1\frac{3}{4}$
<hr/>		
34	2	7
<hr/>		

£	s.	d.
1	1	1
7	6	6
8	4	1
9	6	$10\frac{1}{4}$
8	4	11
4	6	$1\frac{1}{2}$
<hr/>		

£	s.	d.
11	11	$1\frac{1}{4}$
18	18	$6\frac{1}{4}$
14	19	7
17	14	$6\frac{1}{4}$
18	13	$1\frac{1}{2}$
86	11	11
<hr/>		

£	s.	d.
14	11	$11\frac{1}{4}$
18	16	$6\frac{3}{4}$
16	12	$1\frac{1}{4}$
18	18	$8\frac{3}{4}$
46	18	$1\frac{1}{4}$
11	11	11
<hr/>		

£	s.	d.
18	19	$6\frac{1}{4}$
81	11	$1\frac{1}{4}$
60	10	0
51	0	11
76	1	$1\frac{1}{4}$
11	7	$1\frac{1}{4}$
<hr/>		

£	s.	d.
18	18	$8\frac{1}{2}$
91	19	11
33	13	$3\frac{1}{2}$
77	11	0
18	8	$1\frac{1}{2}$
11	11	0
<hr/>		

T R O Y.

TROY WEIGHT.

oz. dwts. gr.	oz. dwts. gr.	lb. oz. dwts. gr.
1 19 23	11 11 11	11 11 19 23
6 11 1	6 10 21	18 10 11 10
11 16 13	1 1 19	11 1 18 16
11 11 11	8 16 11	19 9 14 11
16 19 21	1 1 10	11 11 11 13
10 10 0	7 18 11	16 10 0 0

A VOIRDUPOISE WEIGHT.

lb. oz. dr.	lb. oz. dr.	Cwt. qrs. lb.
11 15 14	1 1 1	1 1 26
16 14 11	7 1 9	7 2 19
11 10 10	1 6 10	6 1 14
14 15 11	4 11 14	1 0 27
16 13 10	6 10 12	3 1 0
11 8 6	1 12 11	1 1 0

APOTHECARIES WEIGHT.

3 9 gr.	3 3 9 gr.	lb 3 3 9
3 1 9	3 3 1 0	7 1 4 1
7 1 17	7 6 2 14	3 9 5 2
5 0 15	5 0 1 18	7 5 7 1
6 2 16	9 0 1 14	9 10 2 0
3 0 18	3 0 2 18	3 1 7 1
7 1 17	9 0 0 19	7 2 1 1

CLOTH

CLOTH MEASURE.

<i>EP. qrs. n.</i>	<i>Yds. qrs. n.</i>	<i>EE. qrs. n.</i>
81 2 3	41 1 2	45 4 3
74 1 2	16 3 1	11 1 2
16 0 0	11 1 3	14 2 1
54 1 1	18 2 0	44 3 0
11 1 2	15 1 2	15 1 3
51 2 1	74 3 1	11 0 0
<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>

LONG MEASURE.

<i>F. in. bar.</i>	<i>Yds. ft. in.</i>	<i>Lea. m. fur. p.</i>
17 11 2	16 2 11	10 2 7 36
45 10 1	44 1 2	16 1 2 11
14 9 0	15 1 10	19 2 5 31
18 5 2	71 1 8	45 1 2 26
70 1 0	46 2 0	36 0 6 19
41 8 1	54 0 7	10 1 4 24
<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>

LAND MEASURE.

<i>A. r. p.</i>	<i>A. r. p.</i>	<i>A. r. p.</i>
27 1 14	18 3 14	11 3 11
35 2 15	15 1 20	61 1 24
97 1 16	16 2 31	11 2 11
36 2 15	11 1 24	14 1 21
75 3 27	18 3 11	11 3 11
11 1 19	16 2 10	24 1 32
<hr/>	<hr/>	<hr/>
<hr/>	<hr/>	<hr/>

WINE

WINE MEASURE.

<i>Run. gal. qts.</i>	<i>Tier. gal. qts.</i>	<i>T. hhd. gal. qts.</i>
78 4 1	18 16 2	97 3 54 1
91 15 2	15 14 1	54 1 19 2
45 10 3	84 13 0	75 2 16 1
56 14 1	62 15 1	17 0 39 0
35 15 3	74 41 3	19 2 56 3
28 17 2	25 35 2	14 3 27 1

ALE and BEER MEASURE.

<i>AB. fir. gal.</i>	<i>BB. fir. gal.</i>	<i>Hhds. gal. qts.</i>
74 0 4	35 2 5	56 38 1
95 3 7	45 0 7	55 16 1
75 1 4	78 2 5	31 32 3
96 2 0	97 3 8	17 27 1
17 3 5	54 1 7	84 11 0
25 2 7	37 2 8	11 0 1

DRY MEASURE.

<i>Qrs. bu. p.</i>	<i>Ch. bu. p.</i>	<i>Ch. bu. p.</i>
94 2 1	76 35 2	54 31 1
55 0 1	14 10 1	14 11 2
78 7 1	15 11 3	15 29 1
51 2 2	18 16 2	14 17 2
36 2 3	14 24 1	11 4 1
75 1 0	17 31 2	19 19 0

T I M E.

T I M E.

H.	m.	s.	D.	b.	m.	W.	d.	h.
11	59	10	4	21	40	1	6	21
17	11	40	1	20	11	7	4	11
11	10	19	6	23	49	1	1	16
74	19	11	1	12	11	4	3	14
11	18	26	5	19	54	1	0	10
45	17	49	1	11	11	5	1	17
<hr/>			<hr/>			<hr/>		
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A P P L I C A T I O N.

1. A Man had four Sons, the Eldest was 15 Years of Age, the two next 13, and the Youngest 12; what was the Sum of all their Ages.

Ans. 53.

2. A Gentleman has in Berkshire 741 Acres, in Wiltshire 642, and in Gloucestershire 1246; how many has he in all?

Ans. 2629.

3. A Merchant received from A £327, from B £104, and from C 19 Thousand, 19 Hundred and 19 Pounds: how much did he receive in all?

Ans. £21350.

4. A Person has a Purse, which contains 6 Guineas, 5 Crowns, 4 Half-crowns, 7 Sixpences, and a Moindre; how much Sterling is the Sum?

Ans. £9 11. 6.

5. A certain Number of Soldiers having plundered a City and taken a certain Quantity of Money, the Officers agree to give the common Men £397 19 7½, among them, and to keep the Remainder themselves, which was just £4000; how much was taken in all?

Ans. £4397 19 7½.

6. A Far-

A Farmer paid his Rent, 296*l.* 10*s.*—Servants Wages, 41*l.* 10*s.* 6*d.*—For a Saddle, two Guineas.—A Bridle, 3*s.* 6*d.*—A Basket, 9*d.*—A Hat, fifteen Shillings, and for ten Oxen, one Hundred Pounds. How much did he pay in the whole? *Ans.* 441*l.* 1*s.* 9*d.*

The Effects of a Merchant are, in Goods 5724*l.* 10*s.* 9½*d.*—In Notes 4175*l.*—The Balance of Book Debts 7612*l.* 11*s.* 10½*d.*—Bonds, one Thousand Pounds. Furniture, 912*l.* 11*s.* 2½*d.*—And in Cash, two Thousand and Forty-seven Pounds, Four Shillings and Three Farthings. Required his whole Estate?

Ans. 21471*l.* 17*s.* 11½*d.*

A Nobleman has, in the County of Northumberland, an Estate worth twenty-three Thousand, six Hundred and eighty-nine Pounds, thirteen Shillings and ten Pence, yearly: In Yorkshire, an Estate worth five Thousand and seven Pounds: And in Kent, sixteen Thousand, eight Hundred and two Pounds, four Shillings and eleven Pence. Required his annual Revenue?

Ans. 45498*l.* 18*s.* 9*d.*

Two Men set out at the same Instant of Time; the one travels 49 Miles due North, and the other 47 due South; how far are they asunder? *Ans.* 96 Miles.

SUBTRACTION of MONEY, WEIGHTS, and MEASURES.

SUBTRACTION of Money, Weights, &c. commonly called Compound Subtraction, teacheth to know the Difference between any two Sums of divers Denominations.

RULE. Place those Numbers under each other, which are of the same Denomination; the less being below the greater, begin with the least Denomination, and if it exceed that in the upper, borrow as many Units as make one of the next greater; remembering always to add

C

one

one to the next superior under Number towards the left Hand for that which you borrowed.

Of M O N E Y.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
From	7	4	6
Take	1	16	1

Remains 5 8 5

Proof 7 4 6

	<i>l.</i>	<i>s.</i>	<i>d.</i>
From	19	1	1
Take	7	4	10½

Remains

Proof

	<i>l.</i>	<i>s.</i>	<i>d.</i>
From	16	14	1
Take	11	11	11

Remains

Proof

	<i>l.</i>	<i>s.</i>	<i>d.</i>
From	14	11	6½
Take	11	16	4½

Remains

Proof

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Borrowed	400	0	0
Paid at fundry Times	40	7	4½
	17	11	10
	54	18	6
	49	19	6½

Paid in all

Remains unpaid

Proof

Lent

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Lent	500	0	0
Received at sundry Times	10	0	0
	19	19	0
	17	11	11½
	15	15	6½
	44	16	4½
	59	19	11
	18	18	10
	14	16	6
	100	0	0
	94	11	11
Received in all			
To receive			
Proof			

OF AVOIRDUPOISE WEIGHT.

	<i>tons</i>	<i>cwt.</i>	<i>qr.</i>	<i>lb.</i>
From	19	12	1	27
Take	11	10	2	16
Remains				
Proof				

	<i>lb.</i>	<i>oz.</i>	<i>dr.</i>
From	14	1	8
Take	1	4	5
Remains			
Proof			

	<i>cwt.</i>	<i>qr.</i>	<i>lb.</i>
From	14	1	20
Take	7	2	21
Remains			
Proof			

OF TROY WEIGHT.

	<i>lb. oz. dwt. gr.</i>	<i>oz. dwt. gr.</i>
From	110 10 14 21	12 11 10
Take	22 0 16 23	8 16 21

Remains

Proof

	<i>oz. dwt. gr.</i>	<i>lb. oz. dwt. gr.</i>
From	8 14 20	141 11 13 12
Take	4 11 22	78 6 15 22

Remains

Proof

OF APOTHECARIES WEIGHT.

	<i>lb. ʒ ʒ ʒ gr.</i>	<i>lb. ʒ ʒ ʒ gr.</i>
From	15 6 3 2 13	27 8 5 0 17
Take	11 11 5 0 18	19 10 6 2 13

Remains

Proof.

	<i>lb. ʒ ʒ ʒ gr.</i>
From	14 11 2 1 17
Take	7 0 5 2 29

Remains

Proof

OF CLOTH MEASURE.

	<i>yds. qr. na.</i>	<i>ells. qr. na.</i>
From	81 1 3	72 3 1
Take	19 3 1	28 4 3

Remains

Proof

	<i>ells fle. qr. na.</i>	<i>ells fr. qr. na.</i>
From	56 1 3	19 3 2
Take	16 0 1	6 5 3

Remains

Proof

Of LONG MEASURE.

	<i>m. f. p.</i>	<i>l. m. f. p.</i>
From	2 1 18	7 1 4 26
Take	0 4 39	2 2 2 29

Remains

Proof

	<i>yds. f. in.</i>	<i>m. f. p.</i>
From	86 1 10	18 1 6
Take	18 2 11	8 7 10

Remains

Proof

OF LAND MEASURE.

	<i>a.</i>	<i>r.</i>	<i>p.</i>		<i>a.</i>	<i>r.</i>	<i>p.</i>
From	178	1	10		2000	2	0
Take	59	3	10		706	1	18

Remains

Proof

	<i>a.</i>	<i>r.</i>	<i>p.</i>		<i>a.</i>	<i>r.</i>	<i>p.</i>
From	150	1	18		28	3	6
Take	36	3	28		17	0	19

Remains

Proof

OF WINE MEASURE.

	<i>tons</i>	<i>bbds.</i>	<i>gal.</i>	<i>qts.</i>		<i>bbds.</i>	<i>gal.</i>	<i>qts.</i>
From	5	1	15	2		13	18	0
Take	3	2	46	1		8	27	3

Remains

Proof

	<i>tons</i>	<i>bbds.</i>	<i>gal.</i>	<i>qts.</i>		<i>bbds.</i>	<i>gal.</i>	<i>qts.</i>
From	3	0	18	2		2	33	2
Take	1	3	36	3		1	39	3

Remains

Proof

OF WINCHESTER MEASURE.

	<i>bbs. gal. qts.</i>	<i>bb. fir. gal.</i>
From	33 18 2	12 0 3
Take	17 28 3	6 1 1

Remains

Proof

	<i>bbs. gal. qts.</i>	<i>ab. fir. gal.</i>
From	18 27 2	18 2 3
Take	12 19 3	10 3 7

Remains

Proof

OF DRY MEASURE.

	<i>chal. bu. p.</i>	<i>qrs. bu. p.</i>
From	108 13 2	200 6 2
Take	82 29 2	110 7 3

Remains

Proof

	<i>chal. bu. p.</i>	<i>qrs. bu. p.</i>
From	500 15 2	208 5 3
Take	228 31 3	109 6 1

Remains

Proof

Of

O F T I M E .

	<i>m.</i>	<i>w.</i>	<i>d.</i>
From	11	1	4
Take	7	3	5

Remains

Proof

	<i>h.</i>	<i>m.</i>	<i>s.</i>
From	10	46	59
Take	1	19	17

Remains

Proof

	<i>d.</i>	<i>h.</i>	<i>m.</i>	<i>s.</i>
From	5	11	14	1
Take	1	21	48	56

Remains

Proof

A P P L I C A T I O N .

1. The Author of this Book was born in the Year 1757, how old will he be in the Year, 1789?

Ans. 32 Years.

2. A Gentleman had a Son born on March, the 14th, and a Daughter on the 21st of February following, and two Years after the Birth of the Daughter, the Father was 37 Years of Age. I demand the Age of the Father at each of their Births?

Ans. The Father's Age at the Birth of his Son, was 34 Years, and 31 Days; and at the Birth of his Daughter 35 Years.

3. A Gentleman has an Estate in Berkshire, which brings in 374*l.* per Annum, and another in Wiltshire only

only 249*l.* 19*s.* How much does the former exceed the latter in its annual Income? *Ans.* 124*l.* 0*s.* 4*d.*

4. The Distance between London and the Tropic of Cancer is 1684 Miles, and between London and the Equator 3092, allowing 60 Miles to a Degree. I demand the Distance between the Tropic and the Equator?

Ans. 1408 Miles.

5. I sent my Servant to Market with ten Guineas to buy Goods; he brought from one Merchant Wares to the Amount of 1*l.* 17*s.* 5½*d.* to another Merchant he paid three Guineas and three Quarters, his own Expences amounted to 2*s.* 7½*d.* Pray how much Money did he return me?

Ans. 4*l.* 11*s.* 2½*d.*

6. A Merchant failing, owed as follows, to A. 517*l.* 8*s.* 9½*d.* to B. 175*l.* to C. 107*l.* 19*s.* 11½*d.* to D. 271*l.* 16*s.* 11*d.* and to E. 517*l.* 10*s.* 6½*d.* His Effects at that Time were as under: In Cash, 210*l.* 11*s.* 5½*d.* in Wares, 397*l.* 17*s.* 6½*d.* in household Furniture, 187*l.* 10*s.* 9*d.* and in Book Debts, 297*l.* 10*s.* 5½*d.* How much will his Creditors lose, supposing his Book Debts all good? *Ans.* 496*l.* 6*s.*

COMPOUND MULTIPLICATION.

COMPOUND Multiplication is extremely useful in finding the Value of Goods, which will evidently appear from the Manner of working the following Examples.

C A S E I.

When the Quantity does not exceed 12 Yards, Gallons, &c. set down the Price of 1 Yard, and place the Quantity under the least Denomination of the Multiplier, and in multiplying by it, observe the same Rules

as

as in Compound Addition, for carrying from one Denomination to another.

E X A M P L E S.

Multiply By	<i>l.</i>	<i>s.</i>	<i>d.</i>
	14	14	6
			3
	<hr/>		
	44	3	6
	<hr/>		

<i>l.</i>	<i>s.</i>	<i>d.</i>
19	19	4
		5
<hr/>		
<hr/>		

<i>l.</i>	<i>s.</i>	<i>d.</i>
7	4	11 $\frac{1}{4}$
		7
<hr/>		
<hr/>		

<i>l.</i>	<i>s.</i>	<i>d.</i>
48	8	10 $\frac{1}{2}$
		9
<hr/>		
<hr/>		

<i>l.</i>	<i>s.</i>	<i>d.</i>
14	14	9 $\frac{3}{4}$
		11
<hr/>		
<hr/>		

Multiply By	<i>l.</i>	<i>s.</i>	<i>d.</i>
	17	10	6
			4
	<hr/>		
	<hr/>		

<i>l.</i>	<i>s.</i>	<i>d.</i>
48	11	11
		6
<hr/>		
<hr/>		

<i>l.</i>	<i>s.</i>	<i>d.</i>
11	11	7 $\frac{1}{2}$
		8
<hr/>		
<hr/>		

<i>l.</i>	<i>s.</i>	<i>d.</i>
17	19	6
		10
<hr/>		
<hr/>		

<i>l.</i>	<i>s.</i>	<i>d.</i>
19	7	5 $\frac{1}{4}$
		12
<hr/>		
<hr/>		

C A S E

C A S E II.

When the Multiplier is above 12, find two Numbers whose Product is equal to it. Multiply the given Price by either of them, and the Result by the other.

E X A M P L E S.

Required the Value of 24 Yards at 4s. $7\frac{1}{2}d.$ per Yard.

O P E R A T I O N.

$$\begin{array}{r} 4 \quad 7\frac{1}{2} \\ \hline 1 \quad 7 \quad 9 \\ 4 \end{array}$$

5 11 0 *Answer.*

Required the Value of 60 Yards, at 2s. 4d. per Yard? *Ans. 7l.*

What is the Value of 42 Gallons, at 8s. 11d. per Gallon? *Ans. 18l. 14s. 6d.*

How much do 36 Ells come to, at 9s. 9d. per Ell? *Ans. 17l. 11s.*

What is the Value of 72 Gallons of Brandy, at 12s. 6d. per Gallon? *Ans. 45l.*

Bought 144 Yards of Cloth, at 13s. 6d. per Yard. What does it stand me in? *Ans. 97l. 4s.*

Required the Value of 54 Ells, at 3s. 8d. per Ell? *Ans. 9l. 18s.*

What cost 96 Yards, at 5s. 4d. per Yard? *Ans. 25l. 12s.*

Thirty-three Yards, at 2s. $7\frac{1}{2}d.$ per Yard? *Ans. 4l. 6s. $7\frac{1}{2}d.$*

Re-

Required the Value of 108 Yards of Cloth, at 17s. 10d. per Yard? *Ans.* 96l. 6s.

What cost 81 Ells, at 3s. 10d. per Ell?

Ans. 15l. 10s. 6d.

How much do 9 Parcels weigh, each weighing 3qr. 10lb. 8oz. 12dr.?

Ans. 7cwt. 2qr. 10lb. 14oz. 12dr.

What is the Content of 16 Fields, each containing 13A. 3r. 16p.

Ans. 221A. 2r. 16p.

C A S E III.

When the Quantity is such a Number that no two Numbers in the Table will produce it exactly, then multiply by two such Numbers as come the nearest to it; and for the Number wanting, multiply the Price of one Yard by the Number of Yards, and add the Products together for the Answer.

But if the two Numbers exceed the given Quantity, then find the Value of the overplus, and subtract it from the last Product, and the Remainder will be the Answer.

E X A M P L E S.

What is the Value of 29 Yards of Cloth, at 14s. 7d. per Yard?

	s.	d.	
	14	7	Price of 1 Yard
		3	
<hr/>			
2	3	9	Price of 3 Yards
		9	
<hr/>			
19	13	9	Price of 27 Yards
1	9	2	Price of 2 Yards
<hr/>			
21	2	11	Price of 29 Yards

This

This Question may be performed by first finding the Value of 30 Yards, from which if you take the Price of one Yard, the Remainder will be the Value of 29 Yards as before.

What cost 61 Yards, at 3s. 4½d. per Yard?

Ans. 10l. 5s. 10½d.

What is the Value of 140½ Yards, at 17s. 2d. per Yard?

Ans. 120l. 7s. 7½d.

What cost 123 Gallons, at 1l. 15s. 3d. per Gallon?

Ans. 216l. 15s. 9d.

What is the Value of 41½ Yards, at 7s. 9d. per Yard?

Ans. 16l. 1s. 7½d.

What cost 82 Gallons of Wine, at 3s. 9½d. per Gallon?

Ans. 15l. 10s. 11d.

What is the Value of 65¾ Yards, at 2s. 10d. per Yard?

Ans. 9l. 6s. 3½d.

What is the Price of 73½ Yards, at 7s. 9d. per Yard?

Ans. 28l. 9s. 7½d.

What is the Value of 91 Yards, at 12s. 8d. per Yard?

Ans. 57l. 12s. 8d.

A P P L I C A T I O N.

1. An Army consisting of 500 Men having plundered a City, and taken so much Money, that when it was shared among them, they received 75l. apiece. How much was taken in all?

Ans. 37500l.

2. What is the Weight of 5 Hogsheads of Sugar, each weighing, neat 3cwt. 1qr. 26lb.?

Ans. 17cwt. 1qr. 18lb.

3. A Gentleman is possessed of 12 Silver Table Spoons, each weighing 2 oz. 14 dwt.; 18 of Tea ditto, each weighing 14½ dwt.; 2 Silver Mugs, each 13 oz. 17 dwt. and a Silver Tankard, 23 oz. 13 dwt. Pray how many Ounces of Silver has he?

Ans. 8lb. 0oz. 16dwts.

4. In 18 Pieces of Cloth, each whereof measure^s 18 Ells English 2 Quarters 3 Nails, how many Ells?

Ans. 333^e. 4^{qr}. 2ⁿ.

5. How many Gallons of Wine are there in 7 Casks, each containing 27 Gallons, 2 Quarts and 1 Pint?

Ans. 193^{gal}. 1^{qt}. 1^{pt}.

6. What Quantity of Yards are there in 24 Pieces of hanging Paper, each of which measures 11 Yards, 2 Quarters and 3 Nails?

Ans. 280^{yds}. 2^{qrs}.

COMPOUND DIVISION.

COMPOUND Division is the dividing of Numbers of different Denominations; in doing which, always begin at the highest, and continue the Operation to the lowest.

RULE. Divide the Price by the Quantity, beginning at the highest Denomination; and if any thing remain, reduce it into the next, and every inferior Denomination, and divide as before; remembering to add the odd Shillings and Pence, &c. if any, at every Reduction of their Values, and you will have the Value of unity required.

EXAMPLES.

Divide 478^l. 18^s. 6^d. by 6.

$$\begin{array}{r} \text{l. s. d.} \\ 6 \overline{) 478 \ 18 \ 6} \\ \hline \end{array}$$

79 16 5 Quotient.

$$\begin{array}{r} \text{l. s. d.} \\ 5 \overline{) 63 \ 17 \ 9\frac{1}{2}} \\ \hline \end{array}$$

$$\begin{array}{r} \text{l. s. d.} \\ 4 \overline{) 23 \ 17 \ 8} \\ \hline \end{array}$$

$$\begin{array}{r} \text{l. s. d.} \\ 6 \overline{) 47 \ 18 \ 10\frac{1}{2}} \\ \hline \end{array}$$

$$\begin{array}{r} \text{l. s. d.} \\ 7) 91 \quad 14 \quad 5\frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} \text{l. s. d.} \\ 8) 28 \quad 19 \quad 4 \\ \hline \end{array}$$

$$\begin{array}{r} \text{l. s. d.} \\ 9) 32 \quad 16 \quad 7\frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} \text{l. s. d.} \\ 10) 33 \quad 11 \quad 8 \\ \hline \end{array}$$

$$\begin{array}{r} \text{l. s. d.} \\ 11) 74 \quad 18 \quad 6\frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} \text{ton. cwt. qr. lb.} \\ 4) 17 \quad 12 \quad 1 \quad 18 \\ \hline \end{array}$$

$$\begin{array}{r} \text{ton. cwt. qr. lb.} \\ 5) 7 \quad 11 \quad 3 \quad 27 \\ \hline \end{array}$$

$$\begin{array}{r} \text{lb. oz. dr.} \\ 6) 34 \quad 12 \quad 14 \\ \hline \end{array}$$

$$\begin{array}{r} \text{lb. oz. dr.} \\ 7) 8 \quad 13 \quad 15 \\ \hline \end{array}$$

$$\begin{array}{r} \text{lb. oz. dwt. gr.} \\ 6) 23 \quad 10 \quad 17 \quad 22 \\ \hline \end{array}$$

$$\begin{array}{r} \text{lb. oz. dwt. gr.} \\ 7) 15 \quad 11 \quad 5 \quad 18 \\ \hline \end{array}$$

$$\begin{array}{r} \text{lb. oz. dwt. gr.} \\ 8) 31 \quad 6 \quad 19 \quad 4 \\ \hline \end{array}$$

$$\begin{array}{r} \text{lb. oz. dwt. gr.} \\ 9) 7 \quad 4 \quad 17 \quad 15 \\ \hline \end{array}$$

$$\begin{array}{r} \text{lb. } \overline{3} \quad 3 \quad 3 \quad \text{gr.} \\ 10) 31 \quad 11 \quad 7 \quad 1 \quad 10 \\ \hline \end{array}$$

$$\begin{array}{r} \text{lb. } \overline{3} \quad 3 \quad 3 \quad \text{gr.} \\ 11) 54 \quad 6 \quad 3 \quad 2 \quad 19 \\ \hline \end{array}$$

yds. qr. na.

3)14 3 1

e. e. qr. na.

4)59 4 0

e. fr. qr. na.

5)17 3 0

e. fl. qr. na.

6)36 1 2

yds. qr. na.

7)9 2 2

t. hhd. gal. qts.

3)7 3 61 3

t. hhd. gal. pts.

4)3 2 48 6

hhd. gal. qts.

5)31 59 3

hhd. gal. pts.

6)71 18 4

a. b. fir. gal.

5)317 3 7

b. b. fir. gal.

6)16 2 6

a. b. fir. gal.

8)39 2 6

b. b. fir. gal.

12)81 1 8

ch. bu. p.

6)39 18 2

ch. b. p.

9)88 17 3

atr. r. p.

12)108 2 38

a. r. p.

7)17 3 17

mi. fur. po.

8)8 3 28

mi. fur. po.

7)17 7 19

mo. w. d.

6)8 2 6

d. ho. min. sec.

4)18 16 31 52

A P P L I C A T I O N.

L If 6 Yards cost 15s. 6d. what cost one Yard?

O P E R A T I O N.

$$\begin{array}{r}
 6 \overline{) 15 \ 6} \\
 \underline{12 \ 7} \quad \text{Answer} \\
 6 \\
 \underline{15 \ 6} \quad \text{Proof} \\
 0
 \end{array}$$

Those Questions are proved by multiplying the Answer by the same Number you divide by.

2. If 9 Ells cost 2*l.* 1*s.* 3*d.* what cost 1 Ell?
Ans. 5*s.* 8½*d.*
3. If 11 Yards cost 8*l.* 3*s.* 7*d.* what cost 1 Yard?
Ans. 14*s.* 10½*d.*
4. If 12 Gallons of Rum cost 5*l.* 15*s.* 6*d.* what cost 1 Gallon?
Ans.
5. If 11 Yards of Cloth cost 2*l.* 1*s.* 4*d.* what cost 1 Yard?
Ans.
6. If 72 Yards cost 45*l.* what cost 1 Yard?
Ans. 12*s.* 6*d.*
7. If 108 Gallons of Brandy cost 96*l.* 6*s.* what cost 1 Gallon?
Ans. 17*s.* 10*d.*
8. If 144 Gallons of Rum cost 72*l.* what cost 1 Gallon?
Ans. 10*s.*
9. Divide 7898*l.* 17*s.* 9½*d.* equally among 576 Men?
Ans. 13*l.* 14*s.* 3*d.* $\frac{471}{576}$
10. I demand the 447th Part of 741*l.* 17*s.* 6*d.*.
Ans. 1*l.* 13*s.* 2½*d.* $\frac{129}{447}$

11. The Multiplicand being 7454, and the Product 17986502. Pray what was the Multiplier? *Ans.* 2413.

On the 13th of March, 1781, Mr. Herschel, of Bath, discovered a Planet, called the Georgium Sidus, with a Telescope which magnified 200 times, and the Planet's Distance from the Sun being multiplied by the Power by which it was discovered, produced 360000 Millions of Miles. How far is this Planet from the Sun? *Ans.* 1800 Millions of Miles.

OF REDUCTION.

REDUCTION teacheth to bring or change Numbers of one Denomination to others of different Denominations, but of the same Value, and is performed by Multiplication and Division.

Reduction is of two Sorts, viz. Descending and Ascending.

REDUCTION DESCENDING.

RULE. Multiply the highest Denomination given, by as many of the next less as make one of that greater, and thus continue till you have brought it down as low as your Question requires.

Proof. Change the order of the Question.

OF MONEY.

In 18l. 16s. 7d. How many Farthings.

20

376

Shillings

12

4519

Pence

4

Answer 18076 Farthings

To

To prove the above Question, change the Order of it, and it will be, in 18076 Farthings, how many Pounds?

$$\begin{array}{r}
 4)18076 \\
 \hline
 12) 4519 \quad \text{Pence} \\
 \hline
 2,0) 37,6 \quad 7 \text{ Shillings} \\
 \hline
 18 \ 16 \ 7 \quad \text{Answer}
 \end{array}$$

Note. In multiplying by 20, I take in the 16 Shillings, and by 12, I take in the Pence, which must always be done in the like Cases.

2. In 41*l.* 11*s.* 4½*d.* how many Farthings? *Ans.* 39905.
3. In 29*l.* 10*s.* how many halfpence? *Ans.* 14160.
4. In 17 Guineas, how many Pence? *Ans.* 4284.
5. In 19½ Guineas, how many Shillings, Pence, and Farthings? *Ans.* 409*s.*—4914*d.*—19656*q.*
6. In 841 Crowns, how many Sixpences? *Ans.* 8410.
7. In 75 Halfcrowns, how many Pence? *Ans.* 2250.
8. In 1486 Threepences, how many Farthings? *Ans.* 17832.
9. In 84 Pounds, how many Groats and Farthings? *Ans.* 5040 Groats, 80640 Farthings.
10. In 64 Guineas, how many Farthings? *Ans.* 64512.
11. Reduce 32 Moidores into Shillings, Pence, and Farthings? *Ans.* 864*s.*—10368*d.*—41472*q.*
12. Reduce 74 Guineas and three Quarters, into Shillings, Sixpences, Groats, Threepences, and Farthings? *Ans.* 1569*s.*—3139 Sixpences, 4709 Groats, 6279 Threepences, 75348*q.*

REDUCTION ASCENDING.

RULE. Divide the lowest Denomination given by as many of that Name, as make one of the next higher, and thus continue till you have brought it into that Denomination which your Question requires.

1. Reduce 37744 Farthings into Pounds.

O P E R A T I O N.

$$\begin{array}{r}
 4 \overline{) 37744} \\
 \underline{12 \overline{) 9436}} \quad \text{Pence} \\
 \underline{20 \overline{) 78,6}} \quad 4 \quad \text{Shillings} \\
 39 \quad 6 \quad 4 \quad \text{Answer}
 \end{array}$$

2. Reduce 68160 Farthings into Pounds? *Ans.* 711.

3. Reduce 4284 Pence into Guineas?

Ans. 17 Guineas.

4. Reduce 3839 Halfpence, into Pounds?

Ans. 71. 19s. 11½d.

5. Reduce 9000 Farthings, into Pence and Half-crowns

Ans. 2250 Pence—75 Half-crowns.

6. Reduce 5040 Groats into Pounds?

Ans. 84 Pounds.

7. In 13440 Farthings, how many Crowns and Pounds?

Ans. 56 Crowns.—14 Pounds.

8. Reduce 64512 Farthings into Guineas?

Ans. 64 Guineas.

9. Reduce 41742 Farthings into Pence, Shillings, and Moidores?

Ans. 10368d.—864s.—32 Moidores.

10. Reduce 40656 Farthings into Pence, Groats, and Shillings?

Ans. 10164d.—2541 Groats, 847s.

11. In

11. In 8472 Pence, how many Shillings and Guineas? *Ans.* 706s.—33 Guineas and 13s. over.

12. Reduce 75348 Farthings into Groats and Guineas?

Ans. 4709 Groats, 1d.—74 Guineas, and 15s. 9d. over.

REDUCTION DESCENDING and ASCENDING.

Reduction Descending and Ascending, is performed by both Multiplication and Division.

E X A M P L E S.

1. Reduce 84*l.* into Pence and Half-crowns?

Ans. 21160d.—672 Half-crowns:

2. Change 825 Crowns, into Shillings and Guineas?

Ans. 4125s.—196 Guineas 9s.

3. Reduce 109 Half-crowns into Pence and Pounds?

Ans. 3270d.—13*l.* 12s. 6d.

4. Reduce 8174 Pence into Farthings and Guineas?

Ans. 32696 Farthings.—31 Guineas 9s. 2d. over.

5. In 1918 Groats, how many Shillings, Moidores, and Farthings?

Ans. 639s. 4d.—23 Moidores, 18s. 4d.—30688q.

6. Reduce 91 Pounds into Shillings, Guineas, Pence, and Farthings?

Ans. 1820s.—86 Guineas, 14s.—21840d.—37360q.

REDUCTION of WEIGHTS and MEASURES.

Note. Some Sorts of Silks are weighed by a great Pound of 24 Ounces, others by the common Pound of 16 Ounces, therefore,

To bring great Pounds into common, multiply by 3, and divide by 2, or add the half of itself.

To bring small Pounds into great, multiply by 2, and divide by 3, or subtract the third of itself.

THINGS BOUGHT and SOLD by the TALE.

12 Dozen make	- -	1 Groce.
12 Groce	- - - -	1 Great Groce.
24 Sheets of Paper	- -	1 Quire.
20 Quire	- - - -	1 Ream.
2 Reams	- - - -	1 Bundle.
1 Dozen of Parchment	12	Skins.
12 Skins	- - - -	1 Roll.

1. Reduce 461 great Pounds of Silk into Ounces?
Ans. 11064oz.
2. In 672 great Pounds of Silk, how many common Pounds?
Ans. 1008 common lb.
3. In 480 common Pounds of silk, how many great Pounds?
Ans. 320 great lb.
4. Reduce 7cwt. 9. 16lb. of Tobacco into Pounds?
Ans. 828lb.
5. Reduce 2t. 17cwt. 39. of iron into Pounds?
Ans. 6468lb.
6. In 16lb. 11oz. 12dr. how many Drams?
Ans. 4284 Drams.
- 7 Reduce 17864lb. into tons? *Ans.* 7t. 19c. 2q.
- 8 How many Pennyweights of Silver are there in a Tankard that weighs 2lb. 9½oz? *Ans.* 670dwt.
9. In 6 Ingots of Silver, each weighing 31½ Ounces, how many Pennyweights? *Ans.* 3780dwt.
10. Reduce 85440 Grains of Gold into Ounces?
Ans. 1780z.
11. In 4783 Pennyweights of Silver, how many Pounds?
Ans. 19lb. 11oz. 3dwt.
12. Reduce 2lb 7½ 33 29 16gr. into grains.
Ans. 15116gr.
13. Reduce

13. Reduce 15116 Grains into Pounds.
Ans. 2 lb 7 $\frac{3}{4}$ 33 29 16 gr.
14. In 14 Pieces of Cloth, each 27 $\frac{1}{4}$ Yards, how many Yards, Quarters, and Nails?
Ans. 381 $\frac{1}{2}$ yds.—1526 qrs. 6104 n.
15. Reduce 20004 Nails into Ells Flemish.
Ans. 1667 Ells, Flemish.
16. How many Inches in Length make one Mile and a half?
Ans. 95040 Inches.
17. How many Barley Corns will reach from London to the Cape of Good Hope, the Distance being 6068 Miles?
Ans. 1153405440 Barley Corns.
18. How many Barley Corns will reach round the World, the Circumference being 360 Degrees, and each Degree 69 $\frac{1}{2}$ Miles?
Ans. 4755801600 Barley Corns.
19. Reduce 11 Acres, 3 Roods, and 17 Poles into Poles?
Ans. 1897 Poles.
20. Reduce 2720 Perches into Acres?
Ans. 17 Acres.
21. Reduce 1 Pipe of Wine into Pints?
Ans. 1008 Pints.
22. In 1638 Quarts of Wine, how many Hogheads?
Ans. 6 $\frac{1}{2}$ Hogheads.
23. Reduce 81 Barrels of Beer into Quarts.
Ans. 11664 Quarts.
24. Reduce 3583 Pints into Barrels of Ale.
Ans. 14 Barrels.
25. In 4184 Pecks of Coals, how many Chaldrons?
Ans. 29 ch. 2 bush.
26. In 1 Year, how many Minutes, allowing 365 Days and 6 Hours to constitute the same?
27. How many Weeks are there from March 9th to August 26th, both inclusive?
Ans. 24 w. 3 d.

The SINGLE RULE of THREE DIRECT.

WHEN, of four Numbers, there is the same Proportion between the two first, as between the two last, those Numbers are in direct Proportion.

In all Questions belonging to this Rule, three Terms are given, and the fourth sought, which four Terms will be in the above Proportion.

The first and last Terms are the Extremes, and the second and third the Means.

When four Numbers are in direct Proportion, the Product of the two Extremes is equal to the Product of the two Means, that is in the Series $2 :: 6 :: 7 :: 21$, it will be $2 \times 21 = 6 \times 7$ each being = 42.

The Question being properly stated, the Answer may be obtained by either of the three following Rules, but the first is the most general one.

RULE 1. Multiply the second and third Terms together, and divide the Product by the first Term; the Quotient will be the Answer to the Question in the same Denomination you left your middle Number in.

RULE 2. Divide the second Term by the first, and multiply the Quotient into the third Term, and the Product will be the Answer.

RULE 3. Divide the third Term by the first, and multiply the Quotient by the second Term, and the Product will be the Answer.

The first and third Terms must be reduced (if required) into the same Name or Denomination, and the middle Term to the lowest Name mentioned.

1. If 3 Pair of Stockings cost 6s. 3d. what cost 12 Pair?

To

To obtain the Answer, the stating will stand as under.

Pair s. d. Pair

If 3..6 3::12

12

75

12

3)900

300

The Answer in Pence

Proof, by varying the order as under.

Pair l. s. Pair

If 12..1 53

20

25

3

12)75

s. d.

6 3

The Answer

Here I reduce the middle Number into the lowest Denomination, which is Pence, and then multiply it by the third Term, and divide that Product by the first Term, the Quotient will be Pence, because the middle Term was reduced to Pence, which must be divided by 12 and 20, and you have 17. 5s. for the Answer.

E

2. If

2. If 34 Yards cost 16*l.* how much will 51 yards cost?

yds. l. yds.

If 34 $\cdot \cdot$ 16 $::$ 51 To the Answer

3. If 32 Yards cost 18*l.* how much will 144 Yards cost?

*Ans. 81*l.**

4. If 96 Gallons cost 15*l.* how much will 324 Gallons cost?

*50*l.* 12*s.* 6*d.**

5. If 28 Gallons cost 15*l.* 8*s.* how much will 73 Gallons cost?

*Ans. 40*l.* 3*s.**

6. If 1 Yard cost 3*s.* 1½*d.* what will 69 Yards cost?

*Ans. 10*l.* 15*s.* 7½*d.**

7. If 3 Yards cost 9*s.* 3*d.* what cost 68 Yards?

*Ans. 10*l.* 9*s.* 8*d.**

8. If 4 Gallons cost 11*s.* 8*d.* what cost 67 Gallons?

*Ans. 9*l.* 15*s.* 5*d.**

9. If 1 Yard be 1*s.* 5¼*d.* what is the Value of 65 Yards?

*Ans. 4*l.* 13*s.* 5¼*d.**

10. If 65 Yards cost 4*l.* 13*s.* 5¼*d.* what cost 1 Yard?

*Ans. 1*s.* 5¼*d.**

11. If 1 Yard cost 1*s.* 9½*d.* what cost 62 Yards?

*Ans. 5*l.* 11*s.* 1*d.**

12. If 62 Yards cost 5*l.* 11*s.* 1*d.* what cost 1 Yard?

*Ans. 1*s.* 9½*d.**

It will often render the Operation much more concise, if the first and second, or first and third Terms of the stating be divided by their greatest common Divisor.

If 64 Yards cost 4*l.* 10*s.* what will 96 Yards cost?

Now the first and third Terms are divisible by 8, therefore the operation may stand as under.

yds. l. s. yds.

If 8 4 $\cdot \cdot$ 10 $::$ 12

In

In some Cases the Rule of Three may performed without reducing the middle Number as under.

If 4 Yards cost 7s. 6d. what cost 11 Yards?

$$\begin{array}{r}
 \text{yds.} \quad \text{s.} \quad \text{d.} \quad \text{yds.} \\
 \text{If } 4 \cdots 7 \quad 6 :: 11 \\
 \hline
 4 \overline{) 4 \quad 2 \quad 6} \\
 \hline
 1 \quad 0 \quad 7 \frac{1}{2} \quad \text{Answer}
 \end{array}$$

13. Bought a Sack of Hops, containing 2 cwt. 3q. 14lb. for 7 Guineas and seven Pence, what is that per lb.?

Ans. 5½d.

14. If 1 Ton of Iron cost 17l. 10s. what did it cost per lb.?

Ans. 1¾½d.

15. If 1 lb. of Iron cost 1¾ ½d. what is that per ton?

Ans. 17l. 10s.

16. If one Ell English cost 3s. 8d. I demand the value of 11 Pieces, each measuring 31¾ yards?

Ans. 51l. 4s. 5½ ⅔d.

17. If 1 Ell of Cloth cost 3s. 8d. what is that per yard?

Ans. 2s. 11⅓d.

18. If my Income be 2s. 8d. per day, what does it amount to in a Year?

Ans. 48l. 13s. 4d.

19. If the Distance between London and Bath be 107 Miles, I demand how many times a Wheel will turn round in performing the Journey, whose Circumference is 14 Feet 2 Inches?

Ans. 39879 ⅙ Times

20. What will the Tax of 917l. 17s. 6d. amount to at 3s. 9d. in the Pound?

Ans. 172l. 2s. 0¼ ⅓d.

21. A Draper bought of a Merchant 6 Packs of Cloth, each Pack contained 6 Parcels, and each Parcel contained 10 Pieces, each Piece was 30 Yards; he gave after the Rate of 2l. 4s. 3d. for 3 Yards: I desire

to know what 6 Packs cost him, also the Value of 1 Yard?
Ans. 7965*l.* whole cost; 14*s.* 9*d.* per Yard.

22. A certain Tower projected upon level Ground, a Shadow to the Distance of 63 Yards, 1 Foot; when a Staff, 3 Feet in Length, perpendicularly erected, cast a Shadow of 6 Feet 4 Inches; Required the Height of the Tower?
Ans. 90 Feet.

23. It is a Rule in some Parishes to assess the Inhabitants in proportion to two Tenths of their Rent; what is the yearly Rent of that House which pays 8*l.* 10*s.* to the King, under this limitation of 4*s.* in the Pound?
Ans. 42*l.* 10*s.*

24. I am dispatched on a Commission from London to Edinburgh, distant by computation, suppose 350 Miles; and my Rout is settled at 22 Miles per Day, you 4 Days after are sent after me with fresh Orders, and to go 32 Miles per Day; whereabouts on the Road shall I be overtaken by you?

Ans. 68 Miles 3 Fur. 8 Po. on this side Edinburgh.

This Question may be answered by first finding the Gain per Day, and then saying as the Gain per Day is to 1 Day, so is the Miles travelled by me in 4 Days to a fourth Number.

And then it will be as 1 Day is to the Miles travelled by you in 1 Day, so is the above fourth Number to another 4th Number; which being taken from 350 gives the Answer.

THE RULE of THREE INVERSE.

INVERSE Proportion is, when more requires less, or less requires more.

RULE. Multiply the first and second Terms together, and divide the Product by the last, and the Quotient will be the Answer,

E X-

E X A M P L E S.

1. If 32 Men can build a Wall in 12 Days, how long will 48 Men be in performing the same?

It is evident that 48 Men will build the Wall sooner than 32 Men; hence the justness of the above Rule,

$$\begin{array}{r}
 m. \quad d. \quad m. \\
 \text{If } 32 \dots 12 :: 48 \\
 12 \\
 \hline
 48 \overline{) 384} \begin{array}{l} 8 \\ 384 \\ \hline \end{array}
 \end{array}$$

Answer 8 Days

2. If 30 Shillings will pay the Carriage of an hundred weight 150 Miles, how far may 6 hundred weight be carried for the same Money?

Ans. 25 Miles.

3. How long will the Provision necessary for 2400 Men 16 Days, serve 960 Men? *Ans.* 40 Days.

4. When the Price of a Bushel of Wheat is 6s. 3d. the Penny Loaf will weigh 9 Ounces, what must the Penny Loaf weigh when Wheat is 4s. 6d. per Bushel?

Questions of this kind seldom occur in Business.

The DOUBLE RULE of THREE DIRECT.

W H E N five Numbers are given to find a sixth; or seven to find an eighth, &c., the Proportion is called compound.

E 3

RULE.

RULE. Let the principal Cause of Loss or Gain, Action or Passion, be put in the first Place;

That Number which betokeneth Time, Distance of Place, &c. be put in the Second;

And the remaining one in the Third. Place the other two under their like in the Supposition.

If the Blank fall under the third Term, multiply the first and second Terms together for a Divisor, and the other three for a Dividend.

But if the Blank fall under the first or second Place, multiply the third and fourth together for a Divisor, and the other three for a Dividend, and the Quotient will be the Answer.

Proof. By varying their order, or by two Operations in the Single Rule of Three.

E X A M P L E.

If 100*l.* in 12 Months gain 4*l.* Interest, what will 50*l.* gain in 9 Months?

l.	m.	l.
If 100	12	4
50	9	0

Here I multiply the 100 Pounds and 12 Months together for a Divisor, and the other three for a Dividend, and the Answer is 1*l.* 10*s.*

Then to vary the order, it will be, If 50 Pounds in 9 Months gain 1*l.* 10*s.* what will 100*l.* gain in 12 Months? The Answer will evidently be 4 Pounds.

l.	m.	l.	s.
If 50	9	1	10
100	12	0	

By

By two single Operations it will stand as under.

l. l. s. l. l.
If 50—1 10—100—3

m. l. m. l.
And if 9—3—12—4 The Answer

2. If 30 Men can mow 360 Acres of Grass, in 12 Days; how many Men can mow 180 Acres in 6 Days? *Ans.* 15 Men.

3. If 15 Men can mow 180 Acres in 6 Days, how many Men can mow 360 Acres in 12 Days? *Ans.* 30 Men.

4. What Principal will gain 234*l.* in 8 Years at 4½ per Cent. per Annum? *Ans.* 650 Pounds.

5. What Principal will gain 20*l.* in 8 Months, at 6 per Cent. per Annum. *Ans.* 300*l.*

6. If 100*l.* would defray the Expences of 5 Men for 22 Weeks, and 6 Days, how long would 12 Men be in spending of 150*l.* at the same Rate? *Ans.* 14 Weeks and 2 Days.

P R A C T I C E.

PRACTICE is the most useful, and the most compendious Rule in Arithmetic, for by it, the Value of any Quantity of Goods at any given Price is readily obtained.

THE TABLE.

Parts of a Shilling.			Parts of a Pound.			Parts of a Cwt.				
<i>d.</i>			<i>s. d.</i>			<i>qrs. lb.</i>				
6	is	$\frac{1}{2}$	10	0	is	$\frac{1}{2}$	2	0	is	$\frac{1}{2}$
4		$\frac{1}{3}$	6	8		$\frac{1}{3}$	1	0		$\frac{1}{4}$
3		$\frac{1}{4}$	5	0		$\frac{1}{4}$	0	16		$\frac{1}{7}$
2		$\frac{1}{6}$	4	0		$\frac{1}{5}$	0	14		$\frac{1}{8}$
$1\frac{1}{2}$		$\frac{1}{8}$	3	4		$\frac{1}{6}$	0	8		$\frac{1}{16}$
1		$\frac{1}{12}$	2	6		$\frac{1}{8}$	0	7		$\frac{1}{6}$
			2	0		$\frac{1}{10}$				
			1	8		$\frac{1}{12}$				
			1	0		$\frac{1}{20}$				

C A S E I.

When the Price is less than a Penny, take the Part or Parts of a Penny, and divide by 12, and by 20, and you will have the Answer in Pounds, Shillings, and Pence.

$\frac{1}{4}$	$\frac{1}{4}$	7462 at $0\frac{1}{4}$
	12	1865 $\frac{1}{2}$ Pence
	2,0	15,5 5 $\frac{1}{2}$ Shillings and Pence
		7 15 5 $\frac{1}{2}$ Answer

and Schoolmaster's Assistant.

$\frac{1}{2}$	$\frac{1}{2}$	4560 at $0\frac{1}{2}$
	12	2280
	2,0	19,0
		9 10 0 Answer
$\frac{1}{2}$	$\frac{1}{2}$	1776 at $0\frac{1}{2}$
$\frac{1}{4}$	$\frac{1}{4}$	888
		444
	12	1332
	2,0	11,1
		5 11 0 Answer

C A S E II.

When the Price is above a Penny, and less than Shilling, take the Part or Parts of a Shilling, add the together, and divide by 20, and the Answer will Pounds, Shillings, and Pence.

d.	$\frac{1}{12}$	5761 at 1d.
I		
	2,0	48,0 I
		24 0 I Answer
		d. l. s. d.
		745 at $1\frac{1}{4}$ Ans. 3 17 7 $\frac{1}{2}$

		<i>d.</i>	<i>Ans.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>
4567	at	$1\frac{1}{2}$	<i>Ans.</i>	28	10	$10\frac{1}{2}$
7415	at	$1\frac{1}{4}$	<i>Ans.</i>	54	1	$4\frac{1}{4}$
4100	at	2	<i>Ans.</i>	34	3	4
754	at	$2\frac{1}{4}$	<i>Ans.</i>	7	1	4
4110	at	$2\frac{1}{2}$	<i>Ans.</i>	42	16	3
770	at	$2\frac{3}{4}$	<i>Ans.</i>	8	16	$5\frac{1}{2}$
456	at	3	<i>Ans.</i>	5	14	0
567	at	$3\frac{1}{4}$	<i>Ans.</i>	7	13	6
3145	at	$3\frac{1}{2}$	<i>Ans.</i>	45	17	$3\frac{1}{2}$
1111	at	$3\frac{3}{4}$	<i>Ans.</i>	17	7	$2\frac{1}{4}$
2134	at	4	<i>Ans.</i>	35	11	4
1342	at	$4\frac{1}{4}$	<i>Ans.</i>	23	14	$3\frac{1}{2}$
4567	at	$4\frac{1}{2}$	<i>Ans.</i>	85	12	$7\frac{1}{2}$
1234	at	$4\frac{3}{4}$	<i>Ans.</i>	24	8	$5\frac{1}{4}$
5678	at	5	<i>Ans.</i>	118	5	10
9123	at	$5\frac{1}{4}$	<i>Ans.</i>	199	11	$3\frac{1}{4}$
4567	at	$5\frac{1}{2}$	<i>Ans.</i>	104	13	$2\frac{1}{2}$
8912	at	$5\frac{3}{4}$	<i>Ans.</i>	213	10	4
3456	at	6	<i>Ans.</i>	86	8	0
7890	at	$6\frac{1}{4}$	<i>Ans.</i>	205	9	$4\frac{1}{2}$
1234	at	$6\frac{1}{2}$	<i>Ans.</i>	33	8	5
5678	at	$6\frac{3}{4}$	<i>Ans.</i>	159	13	$10\frac{1}{2}$
4789	at	7	<i>Ans.</i>	139	13	7
1234	at	$7\frac{1}{4}$	<i>Ans.</i>	37	4	$6\frac{1}{2}$
5678	at	$7\frac{1}{2}$	<i>Ans.</i>	177	8	9
9123	at	$7\frac{3}{4}$	<i>Ans.</i>	294	11	$11\frac{1}{4}$
4567	at	8	<i>Ans.</i>	152	4	8
8912	at	$8\frac{1}{4}$	<i>Ans.</i>	301	7	1
3456	at	$8\frac{1}{2}$	<i>Ans.</i>	122	8	0
7891	at	$8\frac{3}{4}$	<i>Ans.</i>	307	13	$10\frac{1}{2}$
2345	at	9	<i>Ans.</i>	87	18	9
6789	at	$9\frac{1}{4}$	<i>Ans.</i>	256	13	$2\frac{1}{4}$
1234	at	$9\frac{1}{2}$	<i>Ans.</i>	48	16	11
5678	at	$9\frac{3}{4}$	<i>Ans.</i>	231	10	$10\frac{1}{2}$
9123	at	10	<i>Ans.</i>	380	2	6

		<i>d.</i>		<i>l.</i>	<i>s.</i>	<i>d.</i>
4567	at $10\frac{1}{4}$	<i>Ans.</i>	145	0	$11\frac{1}{2}$	
8912	at $10\frac{1}{2}$	<i>Ans.</i>	389	18	0	
3456	at $10\frac{3}{4}$	<i>Ans.</i>	154	16	0	
7890	at 11	<i>Ans.</i>	361	12	6	
1234	at $11\frac{1}{4}$	<i>Ans.</i>	57	16	$10\frac{1}{2}$	
5678	at $11\frac{1}{2}$	<i>Ans.</i>	272	1	5	
9000	at $11\frac{3}{4}$	<i>Ans.</i>	439	11	8	
1234	at 12	<i>Ans.</i>	61	14	0	

C A S E III.

When the Price is more than a Shilling, and less than two, take the Part or Parts, with as much of the given Price as is more than a Shilling, which add to the given Number, and divide by 20, and you have the Answer.

		<i>d.</i>
$\frac{1}{4}$	$\sqrt{\frac{1}{48}}$	2106 at $12\frac{1}{4}$
		43 $10\frac{1}{2}$
		<hr/>
2,0		214,9 $10\frac{1}{2}$
		<hr/>
		107 9 $10\frac{1}{2}$ Answer
		<hr/>

		<i>d.</i>
$\frac{1}{2}$	$\frac{1}{24}$	3715 at $12\frac{1}{2}$
		154 $9\frac{1}{2}$
		<hr/>
2,0		386,9 $9\frac{1}{2}$
		<hr/>
		193 9 $9\frac{1}{2}$ Answer
		<hr/>

		s.	d.		l.	s.	d.
2712	at	0	$12\frac{3}{4}$	<i>Ans.</i>	144	1	6
2107	at	0	13	<i>Ans.</i>	114	2	7
3215	at	0	$13\frac{1}{4}$	<i>Ans.</i>	177	9	$10\frac{1}{2}$
2790	at	0	$13\frac{1}{2}$	<i>Ans.</i>	156	18	9
7904	at	0	$13\frac{3}{4}$	<i>Ans.</i>	452	16	8
3750	at	0	14	<i>Ans.</i>	218	15	0
3291	at	1	$2\frac{1}{4}$	<i>Ans.</i>	195	8	$0\frac{1}{2}$
9254	at	1	$2\frac{1}{2}$	<i>Ans.</i>	559	1	11
7250	at	1	$2\frac{3}{4}$	<i>Ans.</i>	445	11	$5\frac{1}{2}$
7591	at	1	3	<i>Ans.</i>	474	8	9
6325	at	1	$3\frac{1}{4}$	<i>Ans.</i>	401	18	$0\frac{1}{4}$
5271	at	1	$3\frac{1}{2}$	<i>Ans.</i>	340	8	$4\frac{1}{2}$
3254	at	1	$3\frac{3}{4}$	<i>Ans.</i>	213	10	$10\frac{1}{2}$
2915	at	1	4	<i>Ans.</i>	194	6	8
3270	at	1	$4\frac{1}{4}$	<i>Ans.</i>	221	8	$1\frac{1}{2}$
7059	at	1	$4\frac{1}{2}$	<i>Ans.</i>	485	6	$1\frac{1}{2}$
2750	at	1	$4\frac{3}{4}$	<i>Ans.</i>	191	18	$6\frac{1}{2}$
3725	at	1	5	<i>Ans.</i>	263	17	1
7250	at	1	$5\frac{1}{4}$	<i>Ans.</i>	521	1	$10\frac{1}{2}$
2597	at	1	$5\frac{1}{2}$	<i>Ans.</i>	189	7	$3\frac{1}{2}$
7210	at	1	$5\frac{3}{4}$	<i>Ans.</i>	533	4	$9\frac{1}{2}$
7524	at	1	6	<i>Ans.</i>	564	6	0
7103	at	1	$6\frac{1}{4}$	<i>Ans.</i>	540	2	$5\frac{1}{2}$
3254	at	1	$6\frac{1}{2}$	<i>Ans.</i>	250	16	7
7925	at	1	$6\frac{3}{4}$	<i>Ans.</i>	619	2	$9\frac{1}{2}$
9271	at	1	7	<i>Ans.</i>	733	19	1
7210	at	1	$7\frac{1}{4}$	<i>Ans.</i>	578	6	$0\frac{1}{2}$
2310	at	1	$7\frac{1}{2}$	<i>Ans.</i>	187	13	9
2504	at	1	$7\frac{3}{4}$	<i>Ans.</i>	206	1	2
7152	at	1	8	<i>Ans.</i>	596	0	0
2905	at	1	$8\frac{1}{4}$	<i>Ans.</i>	245	2	$2\frac{1}{2}$
7104	at	1	$8\frac{1}{2}$	<i>Ans.</i>	606	16	0
1004	at	1	$8\frac{3}{4}$	<i>Ans.</i>	86	16	1
2104	at	1	9	<i>Ans.</i>	184	2	0
2571	at	1	$9\frac{1}{4}$	<i>Ans.</i>	227	12	$9\frac{3}{4}$

		s.	d.					
2104	at	1	9 $\frac{1}{2}$	Ans.	188	9	8	
7506	at	1	9 $\frac{3}{4}$	Ans.	688	4	7 $\frac{1}{2}$	
1071	at	1	10	Ans.	98	3	6	
5200	at	1	10 $\frac{1}{4}$	Ans.	482	1	8	
2117	at	1	10 $\frac{1}{2}$	Ans.	198	9	4 $\frac{1}{2}$	
1007	at	1	10 $\frac{3}{4}$	Ans.	95	9	1 $\frac{1}{4}$	
5000	at	1	11	Ans.	479	3	4	
2105	at	1	11 $\frac{1}{4}$	Ans.	203	18	5 $\frac{1}{4}$	
5000	at	1	11 $\frac{1}{2}$	Ans.	489	11	8	
4000	at	1	11 $\frac{3}{4}$	Ans.	395	16	8	

C A S E IV.

When the Price consists of any even Number of Shillings less than 20, multiply the given Quantity by half the Price, and double the first Figure of the Product for Shillings, and the rest of the Product will be Pounds.

		s.	d.		l.	s.	d.
2752	at	2	0	Ans.	275	4	0
3254	at	4	0	Ans.	650	16	0
2710	at	6	0	Ans.	813	0	0
1572	at	8	0	Ans.	628	16	0
2102*	at	10	0	Ans.	1051	0	0
2101	at	12	0	Ans.	1260	12	0
5271	at	14	0	Ans.	3689	14	0
3123	at	16	0	Ans.	2498	8	0
1621	at	18	0	Ans.	1458	180	

* When the Price is 10s. divide the given Quantity by two, and if any remains, it is 10s.

C A S E V.

If the Price consists of odd Shillings, multiply the given Quantity by the Price, and divide by 20, and you have your Desire.

		s.	
		461 at 3	
		- 3	
		<hr/>	
2,0		138,3	
		<hr/>	
		l. s. d.	
		69 3 0	Answer
		<hr/>	

		s.		l.	s.	d.
		3271*at 5 0	Ans.	817	15	0
		2715 at 7 0	Ans.	950	5	0
		3214 at 9 0	Ans.	1446	6	0
		2710 at 11 0	Ans.	1490	10	0
		3179 at 13 0	Ans.	2066	7	0
		2150 at 15 0	Ans.	1612	10	0
		3142 at 17 0	Ans.	2670	14	0
		2150 at 19 0	Ans.	2042	10	0

* When the Price is 5s. divide the Quantity by 4, and if any remains, it is 5s.

C A S E VI.

When the given Price are Shillings and Pence, and the aliquot Part of a Pound, divide by the aliquot Part, and

and you have the Answer at once; but if they are not an aliquot Part, then multiply the Quantity by the Shillings, and take Parts for the Rest, add them together, and divide by 20, and you have the Answer.

			s.	d.		l.	s.	d.
		427 at 1	8	<i>Ans.</i>	35	11	8	
		478 at 2	6	<i>Ans.</i>	59	15	0	
		427 at 3	4	<i>Ans.</i>	71	3	4	
		456 at 6	8	<i>Ans.</i>	152	0	0	

By consulting the Table, you will find that all the above Prices are aliquot, or even Parts of a Pound, the following are not.

		s.	d.		l.	s.	d.
4756	at	3	$6\frac{1}{2}$	<i>Ans.</i>	842	4	2
1240	at	2	7	<i>Ans.</i>	160	3	4
2041	at	5	9	<i>Ans.</i>	586	15	9
4520	at	7	$1\frac{1}{2}$	<i>Ans.</i>	1610	5	0
7456	at	11	5	<i>Ans.</i>	4256	2	8
1200	at	4	10	<i>Ans.</i>	290	0	0
1000	at	6	2	<i>Ans.</i>	368	6	8
7000	at	8	$3\frac{1}{2}$	<i>Ans.</i>	2902	1	8
4216	at	9	5	<i>Ans.</i>	1985	0	8
8274	at	12	$8\frac{1}{2}$	<i>Ans.</i>	5257	8	9

C A S E V I I.

When the Price is Pounds, Shillings, and Pence, and the Shillings and Pence the aliquot Part of a Pound; multiply the given Quantity by the Pounds,

F 2

and

and take Parts for the Shillings and Pence, add them together, and you have the Answer.

<i>s. d.</i>		<i>l. s. d.</i>
1 8	$\frac{1}{12}$	124 at 2 1 8
		2
		<hr/>
		248
		10 6 8
		<hr/>
		258 6 8 Answer
		<hr/>

<i>l. s. d.</i>
422 at 3 2 6
Anf. 1318 15 0
<hr/>

<i>l. s. d.</i>
1234 at 2 3 4
Anf. 2673 13 4
<hr/>

<i>l. s. d.</i>
1248 at 4 6 8
Anf. 5408 0 0
<hr/>

C A S E VIII.

When the Price consists of Pounds, Shillings, and Pence, and the Shillings and Pence, not the aliquot Part of a Pound, reduce it to Shillings, and take Parts for

for the Pence the same as directed in Case the second, add them together, and divide by 20.

		<i>l.</i>	<i>s.</i>	<i>d.</i>		<i>l.</i>	<i>s.</i>	<i>d.</i>
124	at	2	7	2	<i>Ans.</i>	292	8	8
101	—	3	2	1	—	313	10	5
206	—	1	1	5	—	220	11	10
77	—	5	1	11	—	392	7	7
59	—	1	17	10	—	111	12	2
49	—	3	11	7	—	175	7	7
106	—	2	16	$1\frac{1}{2}$	—	297	9	3
121	—	3	1	$8\frac{1}{4}$	—	373	4	$2\frac{1}{4}$
106	—	2	17	7	—	313	3	10
111	—	4	11	10	—	510	11	6
107	—	1	17	$4\frac{1}{2}$	—	199	19	$1\frac{1}{2}$
107	—	2	11	$2\frac{1}{4}$	—	273	17	$0\frac{1}{4}$

C A S E IX.

When both the Price and Quantity are of several Denominations, multiply the Price by the integral Part as in Compound Multiplication, and take Parts for the Rest; add them together, and you have the Answer.

What cost 7 cwt. 2 qrs. 7 lb. at 10*l.* 11*s.* 6*d.* per cwt.

<i>qrs</i>		<i>l.</i>	<i>s.</i>	<i>d.</i>	
2	$\frac{1}{2}$	10	11	6	
				7	
<i>lb.</i>		74	0	6	The Price of 7 cwt.
7	$\frac{1}{8}$	5	5	9	The Price of $\frac{1}{2}$ cwt.
		0	13	$2\frac{1}{2}$	The Price of 7 lb.
		79	19	$5\frac{1}{2}$	Answer.

What is the Value of 14cwt. 1qr. 16lb. at 4l. 17s. 6½d. per cwt. ? *Ans.* 70l. 3s. 3½d.

What is the Value of 11cwt. 3qrs. 14lb. at 5l. 7s. 10d. per cwt. ? *Ans.* 64l. 0s. 6½d.

What cost 10cwt. 0qrs. 8lb. at 16l. 11s. 6d. per cwt. ? *Ans.* 166l. 18s. 8d.

What cost 12cwt. 1qr. 7lb. at 11l. 11s. 6d. per cwt. ? *Ans.* 142l. 10s. 4d.

What cost 18cwt. 1qr. 18lb. at 1l. 17s. 4d. per cwt. *Ans.* 34l. 7s. 4d.

What cost 16cwt. 3qrs. 19lb. at 2l. 10s. 6d. per cwt. ? *Ans.* 42l. 14s. 5½d.

What cost 2cwt. 2qrs. 20lb. at 6l. 4s. 4½d. per cwt. ? *Ans.* 16l. 13s. 4d.

What cost 14cwt. 3qrs. 21lb. at 5l. 7s. 9½d. per cwt. ? *Ans.* 80l. 1s. 4½d.

What cost 8cwt. 0qrs. 21lb. at 7l. 11s. 10½d. per cwt. ? *Ans.* 62l. 3s. 7½d.

TARE, TRETT and CLOFF.

TARE is an Allowance made to the Buyer for the Weight of the Box, Bag, or Vessel, &c. and is either,

1. At so much per Bag, Barrel, &c.
2. At so much per Cent. or,
3. At so much in the whole gross Weight.

TRETT is an Allowance, made by the Merchant to the Buyer of 4lb. in 104lb. which is equal to the twenty-sixth Part, for Waste and Dust, in some sort of Goods.

CLOFF is an Allowance of 2lb. to the Citizens of London, on every Draught above 3cwt. on some sort of Goods.

Gross

Gross Weight is the whole Weight of any sort of Goods, and that which contains it.

Suttle is when Part of the Allowance is taken from the Gross.

Neat is the pure Weight when all Allowances are deducted.

C A S E I.

When the Tare is at so much per Bag, Barrel, &c. multiply the given Number of Barrels, Bags, &c. by the Tare, and subtract the Product from the Gross, the Remainder is neat.

Note. To reduce Pounds into Gallons, multiply by 2, and divide by 15.

1. In 14 Hogsheads of Sugar, each 4cwt. 1qr. 16lb. Gross; Tare per Hoghead, 70lb. how much neat Weight?

	cwt. qr. lb.		cwt. qr. lb.
70	4 1 16	Or thus	4 1 16
14	2		2 14
<hr/>	<hr/>		<hr/>
28)980(35	8 3 4		3 3 2
84	7		2
<hr/>	<hr/>		<hr/>
8 3	61 2 0	Gross	7 2 4
140	8 3 0	Tare	7
140	<hr/>		<hr/>
<hr/>	52 3 0	Neat	52 3 0
...			

2. In 70 Bales of Silk, each 317lb. Gross, Tare 16lb. per Bale, how many Pounds neat?

Ans. 21070 lb. neat.

3. In 7 Frails of Raisins, each weighing 5cwt. 2qs. 5lb. Gross, Tare 23lb. per Frail, how much neat Weight?

Ans. 37cwt. 1qr. 14lb.

4. What

4. What is the neat Weight of 25 Hogsheads of Tobacco, each weighing Gross 163cwt. 2qrs. 15lb. Tare 190lb. per Hoghead? *Ans.* 141cwt. 1qr. 7lb.

C A S E II.

When the Tare is at so much in the whole gross Weight, take the given Tare from the Gross, the Difference is Neat.

1. What is the neat Weight of 75 Hogsheads of Tobacco, each 29cwt. 2qr. 15lb. Tare in the Whole 748lb. *Ans.* 2216cwt. 2qrs. 4lb.

What is the neat Weight of 75 Barrels of Figs, each 2qrs. 27lb. gross, Tare in the Whole, 597lb. *Ans.* 50cwt. 1qr.

C A S E III.

When the Tare is at so much per Cent. and the aliquot Part or Parts of an cwt. divide the gross Weight by such Part or Parts, which subtract from the Gross, and the Remainder is Neat.

1. In 12 Butts of Currants, each 7cwt. 1qr. 10lb. Gross, Tare 16lb. per Cent. how much neat Weight? *Ans.* 75cwt. 1qr. 26lb. 14oz.

2. What is the neat Weight of 30 Barrels of Figs, each 2cwt. 3qrs. Gross, Tare 14lb. per Cent.? *Ans.* 72cwt. 0qrs. 21lb.

C A S E IV.

When the Tare is not the aliquot Part or Parts of an Cwt. multiply the Pounds Gross by the Tare per

per Cent, that Product being divided by 112, gives the Tare; which taken from the Gross, gives the Neat.

1. In 20 Barrels of Anchovies, each 33*lb.* Gross, Tare 10*lb.* per Cent, how much neat Weight.

Ans. 601*lb.* 20*z.*

2. Pray what is the neat Produce of 17 Barrels of Pot-ash, each Gross 203*lb.* Tare 10*lb.* per Cent?

Ans. 3142*lb.* 140*z.*

C A S E V.

When Trett is allowed with Tare, divide the Pounds Suttle by 26, the Quotient is the Trett, which subtract from the Suttle, the Remainder is Neat.

1. In 1 Butt of Currants weighing 11*cwt.* 1*qr.* 4*lb.* Gross, Tare 14*lb.* per Cent. Trett 4 *lb.* per 104 *lb.* how many Pounds Neat?

cwt.	qr.	lb.	
11	1	4	
4			
<hr/>			
45			
28			
<hr/>			
14 = $\frac{1}{8}$ 1264	Gross		
158	Tare		
<hr/>			
26) 1106	Suttle		
42	8 Trett		
<hr/>			
1063	8 Neat		

2. In

2. In 7cwt. 3qrs. 27lb. Gross, Tare 36lb. Trett 4lb. per 104lb. how much Neat. *Ans.* 826

3. In 177cwt. 0qrs. 22lb. Gross, Tare 9lb. per Cent. Trett 4lb. per 104lb. how many Cwt. Neat?

Ans. 156cwt. 2qrs. 22lb.

C A S E VI.

When Cloff is allowed, multiply the cwt. Suttle by two, divide the Product by 3, the Quotient will be the Pounds Cloff, which take from the Suttle, the Remainder is Neat.

1. What is the neat Weight of 3 Hogheads of Tobacco, weighing 16cwt. 1qr. 7lb. Gross, Tare 7lb. per Cent. Trett 4lb. per 104. Cloff 2lb. for 3 cwt.?

	cwt.	qr.	lb.	
$7 = \frac{1}{16}$	16	1	7	Gross
	1	0	2	Tare
	<hr/>			
	15	1	5	Suttle
		1	27	Trett
	<hr/>			
	14	3	6	Suttle
			$9\frac{3}{4}$	Cloff
	<hr/>			
	14	2	$24\frac{1}{4}$	Neat

2. In 7 Hogheads of Tobacco, each weighing Gross 5cwt. 2qrs. 7lb. Tare 8lb. per Cent. Trett 4lb. per 104. Cloff 2lb. for 3 Cwt. how much neat Weight?

Ans. 34cwt. 2qrs. 8lb.

VULGAR FRACTIONS.

A VULGAR Fraction is denoted, or expressed by a Numerator, and a Denominator.

The Denominator shews the Number of Parts into which Unity, or one is supposed to be divided. The Numerator shews the Number of these Parts expressed by the Fraction.

Thus $\frac{7}{8}$ stands for seven Eighths, or seven Times the one Eighth of any Integer, or which is the same, it is an expression for 7 divided by Eight.

There are four Sorts of Vulgar Fractions; proper, improper, compound, and mixed; *viz.*

1. A proper Fraction is when the Numerator is less than the Denominator, as $\frac{3}{4}$, $\frac{7}{8}$, $\frac{9}{13}$, $\frac{161}{174}$, &c.

2. An improper Fraction is known by having its Numerator greater than its Denominator, as $\frac{7}{4}$, $\frac{11}{9}$, $\frac{12}{3}$, $\frac{167}{104}$, &c.

3. A compound Fraction is the Fraction of a Fraction, as $\frac{1}{2}$ of $\frac{2}{3}$, &c.

4. A mixed Number or Fraction, is composed of a whole Number and Fraction, as $9\frac{2}{3}$, $14\frac{4}{5}$, &c.

REDUCTION of VULGAR FRACTIONS.

C A S E I.

TO Reduce a Vulgar Fraction to a common Denominator.

RULE. Multiply each Numerator into all the Denominators but its own for a new Numerator.

Multiply all the Denominators for a common Denominator.

E X-

E X A M P L E S.

1. Reduce $\frac{3}{4}$ and $\frac{5}{9}$ to a common Denominator.

Ans. $\frac{27}{36}$, and $\frac{20}{36}$.

$3 \times 9 = 27$ First Numerator. $4 \times 5 = 20$, Second Numerator: and $4 \times 9 = 36$, the common Denominator.

2. Reduce $\frac{4}{7}$, $\frac{11}{12}$, and $\frac{8}{9}$, to a common Denominator.

Ans. $\frac{432}{756}$, $\frac{693}{756}$, and $\frac{672}{756}$.

3. Reduce $\frac{5}{6}$, $\frac{11}{12}$, and $\frac{21}{24}$, to a common Denominator?

Ans. $\frac{1440}{1728}$, $\frac{1584}{1728}$, and $\frac{1512}{1728}$.

4. Reduce $\frac{11}{13}$, $\frac{10}{19}$, and $\frac{121}{144}$, to a common Denominator.

Ans. $\frac{23096}{35368}$, $\frac{18720}{35368}$, and $\frac{27467}{35368}$.

5. Reduce $\frac{24}{49}$, $\frac{17}{18}$, $\frac{4}{3}$, and $\frac{7}{8}$ to a common Denominator?

Ans. $\frac{17280}{35280}$, $\frac{33320}{35280}$, $\frac{18784}{35280}$ and $\frac{30870}{35280}$.

6. Reduce $\frac{1}{7}$, $\frac{2}{8}$, $\frac{74}{160}$, and $\frac{11}{13}$ to a common Denominator?

Ans. $\frac{12000}{84000}$, $\frac{21000}{84000}$, $\frac{64160}{84000}$, and $\frac{62600}{84000}$.

C A S E II.

To reduce a given Fraction to its lowest Terms.

RULE. Divide the lower Term by the Upper, and that Divisor by the Remainder following, till nothing remains; the last Divisor is the common Measure.

Divide both Parts of the Fraction by the common Measure, and the Quotients will compose the required Fraction.

E X A M P L E S.

1. Reduce $\frac{392}{448}$ to its lowest Terms.

Ans. $\frac{7}{8}$.

2. Reduce $\frac{2442}{2664}$, to its lowest Terms.

Ans. $\frac{11}{12}$.

3. Re-

3. Reduce $\frac{13332}{14443}$, to its lowest Terms. *Ans.* $\frac{12}{13}$.
4. Reduce $\frac{115}{116}$, to its lowest Terms. *Ans.* $\frac{11}{16}$.
5. Reduce $\frac{7986}{8052}$, to its lowest Terms. *Ans.* $\frac{127}{127}$.
6. Reduce $\frac{7992}{8064}$, to its lowest Terms. *Ans.* $\frac{11}{12}$.

C A S E III.

To reduce a mixt Number to an improper Fraction.

RULE. Multiply the whole Number by the Denominator of the Fraction: to that Product, add the Numerator for a new Numerator, under which subscribe the given Denominator.

Note. To express a whole Number Fraction-wise, put one for its Denominator.

E X A M P L E S.

1. Reduce $12\frac{3}{7}$ to an improper Fraction. *Ans.* $\frac{87}{7}$.
2. Reduce $9\frac{6}{11}$, to an improper Fraction. *Ans.* $\frac{102}{11}$.
3. Reduce $10\frac{11}{12}$ to an improper Fraction. *Ans.* $\frac{131}{12}$.
4. Reduce $100\frac{1}{2}$ to an improper Fraction. *Ans.* $\frac{201}{2}$.
5. Reduce $8\frac{11}{16}$, to an improper Fraction? *Ans.* $\frac{133}{16}$.
6. Reduce $19\frac{3}{4}$, to an improper Fraction? *Ans.* $\frac{79}{4}$.

C A S E IV.

To reduce an improper Fraction to its proper Terms.

G

RULE

RULE. Divide the upper Term by the lower, and the Quotient will be the whole Number.

Note. This Case and the last prove each other.

E X A M P L E S.

- | | |
|---|----------------------------------|
| 1. Reduce $3\frac{8}{7}$ to its proper Terms. | <i>Ans.</i> $12\frac{2}{7}$. |
| 2. Reduce $1\frac{97}{11}$ to its proper Terms. | <i>Ans.</i> $9\frac{11}{11}$. |
| 3. Reduce $1\frac{31}{12}$ to its proper Terms. | <i>Ans.</i> $10\frac{11}{12}$. |
| 4. Reduce $20\frac{19}{20}$ to its proper Terms. | <i>Ans.</i> $100\frac{19}{20}$. |
| 5. Reduce $1\frac{638}{116}$ to its proper Terms. | <i>Ans.</i> $8\frac{110}{116}$. |
| 6. Reduce $4\frac{22}{23}$ to its proper Terms. | <i>Ans.</i> $19\frac{24}{23}$. |

C A S E V.

To reduce a compound Fraction to a single one.

RULE. Multiply all the Numerators for a new Numerator, and all the Denominators for a new Denominator.

E X A M P L E S.

- | | |
|--|---------------------------------|
| 1. Reduce $\frac{1}{2}$ of $\frac{3}{4}$ to a single Fraction. | <i>Ans.</i> $\frac{3}{8}$. |
| 2. Reduce $\frac{1}{8}$ of $\frac{9}{10}$ of $\frac{11}{12}$ to a single Fraction. | <i>Ans.</i> $\frac{993}{800}$. |
| 3. Reduce $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{1}{4}$ to a single Fraction. | <i>Ans.</i> $\frac{6}{24}$. |
| 4. Reduce $\frac{2}{3}$ of $\frac{1}{4}$ of $\frac{4}{5}$ to a single Fraction. | <i>Ans.</i> $\frac{24}{60}$. |
| 5. Re- | |

5. Reduce $\frac{1}{2}$ of $\frac{1}{12}$ of $\frac{3}{8}$ to a single Fraction.

Ans. $\frac{1}{44}$.

6. Reduce $\frac{7}{8}$ of $\frac{8}{9}$ of $\frac{10}{11}$ to a single Fraction.

Ans. $\frac{360}{99}$.

C A S E VI.

To reduce a Fraction of one Denomination to the Fraction of another, but greater, retaining the same Value.

RULE. Multiply the given Denominator, by all the Denominations between that which it is in, and that which you would reduce it to, for a new Denominator; let its Numerator be the Numerator given.

E X A M P L E S.

1. Reduce $\frac{1}{4}$ of a Shilling to the Fraction of a Pound.

Ans. $\frac{3}{80}$ is equal to $\frac{1}{4}$ of a Shilling.

2. Reduce $\frac{1}{8}$ of a Shilling to the Fraction of a Pound.

Ans. $\frac{3}{160}$.

3. Reduce $\frac{3}{4}$ of a Penny to the Fraction of a Pound.

Ans. $\frac{3}{800}$.

4. Turn $\frac{6}{7}$ of a Pound Avoirdupois into the Fraction of a cwt.

Ans. $\frac{6}{784}$.

5. Reduce $\frac{2}{13}$ of a Pint of Wine to the Fraction of a Hoghead.

Ans. $\frac{2}{6512}$.

C A S E VII.

To reduce Fractions of one Denomination, to the Fraction of another, but less, retaining the same Value.

RULE. Multiply the Numerator by the Parts contained in the several Denominations between it and that you would reduce it to, for a new Numerator, and place it over the given Denominator. Reduce the new Fraction to its lowest Terms, by Case II.

Note. This Case, and Case VI. prove each other.

E X A M P L E S.

1. Reduce $\frac{1}{8}$ of a Pound to the Fraction of a Shilling. *Ans.* $\frac{1}{4}$.
2. Reduce $\frac{1}{16}$ of a Pound to the Fraction of a Shilling. *Ans.* $\frac{1}{8}$.
3. Reduce $\frac{1}{32}$ of a Pound to the Fraction of a Penny. *Ans.* $\frac{1}{4}$.
4. Reduce $\frac{6}{784}$ of a cwt. to the Fraction of a lb. Avoirdupois. *Ans.* $\frac{6}{7}$.
5. Reduce $\frac{9}{1332}$ of a Hogthead of Wine to the Fraction of a Pint. *Ans.* $\frac{9}{11}$.

C A S E VIII.

To reduce Fractions of one Denomination to another of the same Value; having the Numerator of the required Fraction given.

RULE. As the Numerator of the given Fraction is to its Denominator; so is the Numerator of the intended Fraction to its Denominator.

1. Reduce $\frac{1}{2}$ to the Fraction of the same Value, whose Numerator shall be 12. *Ans.* $\frac{12}{2} = 6$.
2. Re-

2. Reduce $\frac{4}{5}$ to the Fraction of the same Value, whose Numerator shall be 8.

Ans. $\frac{8}{10} = \frac{4}{5}$.

3. Reduce $\frac{1}{2}$ of $\frac{2}{3}$ to the Fraction of the same Value, whose Numerator shall be 15.

Ans. $\frac{15}{45} = \frac{2}{3}$.

4. Reduce $\frac{1}{12}$ to the Fraction of the same Value, whose Numerator shall be 22.

Ans. $\frac{22}{264} = \frac{1}{12}$.

C A S E IX.

To reduce Fractions of one Denomination to another of the same Value; having the Denominator of the required Fraction given.

RULE. As the Denominator of the given Fraction is to its Numerator; so is the Denominator of the intended Fraction to its Numerator.

1. Reduce $\frac{2}{3}$ to the Fraction of the same Value, whose Denominator shall be 12.

Ans. $\frac{8}{12} = \frac{2}{3}$.

2. Reduce $\frac{1}{2}$ to the Fraction of the same Value, whose Denominator shall be 24.

Ans. $\frac{12}{24} = \frac{1}{2}$.

3. Reduce $\frac{7}{8}$ to the Fraction of the same Value, whose Denominator shall be 16.

Ans. $\frac{14}{16} = \frac{7}{8}$.

4. Reduce $\frac{4}{5}$ to the Fraction of the same Value, whose Denominator shall be 10.

Ans. $\frac{8}{10} = \frac{4}{5}$.

C A S E X.

To reduce a mixt Fraction to a single one.

I. When the Numerator is the integral Part:

1. Multiply it by the Denominator of the fractional Part, and to that Product, add the Numerator of the fractional Part, for a new Numerator.

G 3

2. Mul

2. Multiply the Denominator of the Fraction by the Denominator of the fractional Part of the Numerator, for a new Denominator.

E X A M P L E S.

1. Reduce $\frac{4\frac{2}{3}}{7}$ $\frac{7}{8}$ to a simple Fraction. *Ans.* $\frac{7}{8}$.
 2. Reduce $\frac{1\frac{7}{8}}{3}$ $\frac{4}{5}$ to a simple Fraction. *Ans.* $\frac{157}{387}$

II. When the Denominator is the integral Part.

1. Multiply it by the Denominator of the fractional Part, and to that Product, add the Numerator of the fractional Part, for a new Denominator.

2. Multiply the Numerator of the Fraction, by the Denominator of the fractional Part, for a new Numerator.

E X A M P L E S.

1. Reduce $\frac{4\frac{3}{4}}{5}$ $\frac{1}{3}$ to a simple Fraction. *Ans.* $\frac{213}{225}$.
 2. Reduce $\frac{5\frac{1}{2}}{6}$ $\frac{4}{5}$ to a simple Fraction. *Ans.* $\frac{255}{310}$.
 3. Reduce $\frac{1\frac{9}{4}}{4}$ $\frac{1}{3}$ to a simple Fraction. *Ans.* $\frac{3}{7}$.

C A S E XI.

To find the proper Quantity of a Fraction in the known Parts of an Integer.

RULE. Multiply the Numerator by the common Parts of the Integer, and divide by the Denominator.

1. Reduce $\frac{1}{3}$ of a Pound Sterling to its proper Quantity. *Ans.* 6s. 8d.

2. Re-

2. Reduce $\frac{6}{7}$ of 5l. 10s. to its proper Quantity.
Ans. 4l. 14s. 3 $\frac{1}{2}$ $\frac{3}{4}$ d.
3. Reduce $\frac{1}{4}$ of a lb. Troy to its proper Quantity.
Ans. 90z.
4. Reduce $\frac{6}{33}$ of a Tun to its proper Quantity.
Ans. 3cwt. 1qr. 20lb.
5. Reduce $\frac{2}{3}$ of a lb. Apothecaries Weight to its proper Quantity.
Ans. 80z.
6. Reduce $\frac{1}{4}$ of an ell English to its proper Quantity.
Ans. 3qrs. 3nauls.
7. Reduce $\frac{9}{11}$ of a Mile to its proper Quantity.
Ans. 6fur. 21po. 4yds. 1ft. 6in.
8. Reduce $\frac{1}{12}$ of an Acre to its proper Quantity.
Ans. 3roods. 26 $\frac{1}{2}$ poles.
9. Reduce $\frac{3}{12}$ of a Hoghead of Wine to its proper Quantity.
Ans. 9gals. 3qrts. 1 $\frac{1}{2}$ $\frac{1}{2}$ pts.
10. Reduce $\frac{7}{8}$ of a Firkin of Ale to its proper Quantity.
Ans. 7gals.
11. Reduce $\frac{5}{18}$ of a Chaldron of Coals to its proper Quantity.
Ans. 10bush.
12. Reduce $\frac{6}{7}$ of a Day to its proper Quantity.
Ans. 20h. 34min. 17 $\frac{1}{7}$ sec.

C A S E XII.

To reduce a given Quantity to the Fraction of any greater Denominator of the same Kind.

RULE. 1. Reduce the given Quantity to the lowest Term mentioned for a Numerator.

2. Reduce the integral Part to the same Name for a Denominator, and that will be the Fraction required.

1. Reduce 6s. 8d. to the Fraction of a Pound.

Ans. $\frac{1}{3}$.
2. Re-

2. Reduce 4*l.* 14*s.* $3\frac{1}{4}$ $\frac{5}{7}$ *d.* to the Fraction of 5*l.* 10*s.*
Ans. $\frac{6}{7}$.
3. Reduce 90*z.* Troy to the Fraction of a *lb.*
Ans. $\frac{3}{4}$.
4. Reduce 3*cwt.* 1*qr.* 20*lb.* to the Fraction of a
Ton.
Ans. $\frac{6}{13}$.
5. Reduce 80*z.* Apothecaries to the Fraction of a *lb.*
Ans. $\frac{2}{3}$.
6. Reduce 3*qrs.* 3*na.* to the Fraction of an Ell
English.
Ans. $\frac{3}{4}$.
7. Reduce 6*fur.* 21*po.* 4*yds.* 1*ft.* 6*in.* to the Fraction of a mile.
Ans. $\frac{9}{11}$.
8. Reduce 3*rd.* 26 $\frac{2}{3}$ *pol.* to the Fraction of an Acre.
Ans. $\frac{1}{12}$.
9. Reduce 9*gal.* 3*qrts.* 1 $\frac{1}{2}$ *pts.* to the Fraction of a
Hogshead of Wine.
Ans. $\frac{3}{5}$.
10. Reduce 7*gal.* of Ale to the Fraction of a Firkin.
Ans. $\frac{7}{8}$.
11. Reduce 10*bu**sh.* of Coals to the Fraction of a
Chaldron.
Ans. $\frac{5}{8}$.
12. Reduce 2*cb.* 34*min.* 17 $\frac{1}{2}$ *sec.* to the Fraction of a
Day.
Ans. $\frac{6}{7}$.

Note. Case 11th and 12th prove each other.

ADDITION of VULGAR FRACTIONS.

RULE. Reduce the given Fraction to a common Denominator, and add all the Numerators together, under which subscribe the common Denominator.

E X A M P L E S.

1. Add $\frac{4}{3}$, $\frac{2}{3}$ and $\frac{7}{12}$ of a Pound together.

Ans. $\frac{36}{12} = 2*l.* 1*s.*$

2. Add

2. Add $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$ together *Ans.* $\frac{47}{60} = 2\frac{7}{60}$.
3. Add $51\frac{2}{3}$, $7\frac{4}{5}$, and $22\frac{1}{5}$ together. *Ans.* $81\frac{2}{5}$.
4. Add $\frac{2}{7}$ and $\frac{2}{3}$ of $\frac{3}{5}$ of $\frac{4}{5}$ together. *Ans.*
5. Add $5\frac{2}{3}$, and $6\frac{7}{8}$ and $4\frac{1}{2}$ together. *Ans.* $17\frac{7}{24}$.
6. Add $\frac{1}{4}$, $\frac{2}{7}$ and $\frac{3}{8}$ together. *Ans.* $1\frac{46}{84}$.

When the Fractions are of several Denominations, reduce them to their proper Quantities, and add as before.

7. Add the $\frac{1}{4}$ of a Pound to the $\frac{1}{2}$ of a Shilling. *Ans.* 15s. 9d. 2qrs.
8. Add $\frac{1}{4}$ of a Pound Troy to the $\frac{1}{8}$ of an Ounce. *Ans.* 99z. 3dwts. 8grs.
9. Add $\frac{4}{5}$ of a Ton to the $\frac{3}{5}$ of a Pound. *Ans.* 16cwt. 0qrs. 0lb. 13oz. $5\frac{1}{3}$ dr.
10. Add $\frac{1}{6}$ of a Yard to the $\frac{1}{3}$ of a Foot. *Ans.* 10in.
11. Add the $\frac{3}{4}$ of a Pound to the $\frac{3}{4}$ of a Guinea. *Ans.* 19s. $10\frac{1}{2}$ d.
12. Add $\frac{4}{16}$, $\frac{8}{100}$, $\frac{1}{1000}$, $\frac{2}{10000}$; and $\frac{5}{100000}$ of a Pound into one Sum. *Ans.* $\frac{48125}{100000} = 9s. 7\frac{1}{2}d.$

SUBTRACTION of VULGAR FRACTIONS.

RULE. Reduce the given Fractions to a common Denominator, and subtract the less Numerator from the greater, and place the Difference over the common Denominator.

When the lower Fraction is greater than the upper, take the Numerator of the lower Fraction from the Denominator, and to that Difference add the upper Nu-

Numerator, carrying one to the Units Place of the lower whole Number.

E X A M P L E S.

- | | |
|---|----------------------------------|
| 1. From $\frac{3}{4}$ take $\frac{2}{7}$. | <i>Ans.</i> $\frac{13}{28}$. |
| 2. From $\frac{2}{3}$ take $\frac{1}{5}$. | <i>Ans.</i> $\frac{7}{15}$. |
| 3. From $\frac{8}{10}$ take $\frac{9}{25}$. | <i>Ans.</i> $\frac{11}{25}$. |
| 4. From $15\frac{2}{7}$ take $\frac{2}{3}$ of $11\frac{3}{4}$. | <i>Ans.</i> $10\frac{79}{140}$. |
| 5. From $\frac{2}{3}$ of 7 take $1\frac{8}{9}$. | <i>Ans.</i> $\frac{41}{27}$. |
| 6. From $14\frac{1}{4}$ take $\frac{2}{3}$ of 17. | <i>Ans.</i> $2\frac{11}{12}$. |

Note. The following Questions must first be reduced to their proper Quantities by Case II, in Reduction.

- | | |
|--|---|
| 7. From the $\frac{3}{4}$ of a Pound take the $\frac{2}{5}$ of a Shilling. | <i>Ans.</i> 11s. 8d. |
| 8. From $\frac{3}{4}$ of a Guinea take $\frac{1}{5}$ of a Pound. | <i>Ans.</i> 2s. 4d. |
| 9. From $\frac{2}{3}$ of a League take $\frac{7}{8}$ of a Mile. | <i>Ans.</i> 1mil. 2fur. 16pal. |
| 10. From the $\frac{1}{4}$ of a Pound Troy take $\frac{1}{6}$ of an Ounce. | <i>Ans.</i> 8oz. 16dwts. 16gr. |
| 11. From $\frac{4}{5}$ of a Ton take $\frac{5}{8}$ of a Pound. | <i>Ans.</i> 15cwt. 3qrs. 27lb. 2oz. 10dr. $\frac{2}{3}$. |
| 12. From 7 Weeks take 9 Days $\frac{7}{10}$. | <i>Ans.</i> 5wks. 4days. 7hrs. 12min. |

MULTIPLICATION of VULGAR FRACTIONS.

RULE. Prepare the given Numbers (if they require it) by the Rules of Reduction; then multiply the Numerators

merators together for a new Numerator, and the Denominators for a new Denominator.

Note. When any Number, either whole or mixt, is multiplied by a Fraction, the Product will always be less than the Multiplicand, in the same Proportion as the multiplying Fraction is less than an Unit.

E X A M P L E S.

1. Multiply $\frac{1}{2}$ by $\frac{6}{7}$. *Ans.* $\frac{3}{7}$.
2. Multiply $3\frac{7}{8}$ by $\frac{2}{3}$ of $\frac{1}{4}$. *Ans.* $1\frac{5}{8}$.
3. Multiply $84\frac{1}{8}$ by 7, *Ans.* 588 $\frac{7}{8}$.
4. Multiply $\frac{21}{32}$ by $\frac{12}{14}$. *Ans.* $\frac{21 \times 2}{32 \times 7} = \frac{3}{8}$.
5. Multiply $\frac{9}{10}$ by $\frac{2}{3}$ of $\frac{1}{4}$ of $\frac{5}{6}$. *Ans.* $\frac{3}{8}$.
6. Multiply $9\frac{1}{2}$ by $\frac{2}{3}$. *Ans.* $3\frac{1}{3}$.
7. Multiply $\frac{1}{2}$ of 9 by $\frac{7}{8}$. *Ans.* $5\frac{7}{8}$.
8. Multiply 24 by $\frac{2}{3}$. *Ans.* 16.
9. Multiply $\frac{1}{2}$ of 7 by $\frac{3}{6}$. *Ans.* $1\frac{1}{2}$.
10. Multiply $51\frac{2}{3}$ by $\frac{6}{7}$ and the Product by 8. *Ans.* $354\frac{2}{7}$.
11. Multiply 12 by $\frac{1}{2}$. *Ans.* 6.
12. Multiply $\frac{1}{2}$ of 3 by $\frac{1}{4}$ of 8. *Ans.* 9.

. DIVISION of VULGAR FRACTIONS.

RULE. Prepare the given Numbers (if required) by the Rules of Reduction, multiply the Denominator of the Divisor, into the Numerator of the Dividend, for a new Numerator, and the Numerator of the Divisor, into the Denominator of the Dividend, for a new Denominator.

Note.

Note. If a whole Number be divided by a Fraction less than unity, the Quotient will be greater than the Dividend; but if any Fraction be divided by a whole Number greater than unity, the Quotient will be less than the Dividend.

Multiplication and Division prove each other.

E X A M P L E S.

- | | |
|---|---------------------------------|
| 1. Divide $\frac{17}{27}$ by $\frac{3}{7}$. | <i>Ans.</i> $1 \frac{22}{63}$. |
| 2. Divide $\frac{13}{19}$ by $\frac{7}{9}$. | <i>Ans.</i> $\frac{117}{133}$. |
| 3. Divide $\frac{14}{11}$ by $\frac{7}{16}$. | <i>Ans.</i> $1 \frac{14}{11}$. |
| 4. Divide $1 \frac{1}{2}$ by $4 \frac{8}{10}$. | <i>Ans.</i> $\frac{30}{96}$. |
| 5. Divide $\frac{7}{8}$ by 4. | <i>Ans.</i> $\frac{7}{32}$. |
| 6. Divide 4 by $\frac{7}{8}$. | <i>Ans.</i> $4 \frac{4}{7}$. |
| 7. Divide 74 by 116. | <i>Ans.</i> $1 \frac{1}{19}$. |
| 8. Divide $\frac{1}{3}$ of 19 by $\frac{2}{3}$ of $\frac{1}{2}$. | <i>Ans.</i> $7 \frac{1}{10}$. |
| 9. Divide $\frac{1}{2}$ of $\frac{2}{3}$ by $\frac{2}{3}$ of $\frac{1}{4}$. | <i>Ans.</i> $\frac{3}{4}$. |
| 10. Divide $\frac{2}{3}$ of $\frac{1}{4}$ by $\frac{1}{2}$ of $\frac{1}{3}$. | <i>Ans.</i> $1 \frac{1}{24}$. |
| 11. Divide $4 \frac{5}{9}$ by $\frac{5}{9}$ of 4. | <i>Ans.</i> $2 \frac{1}{10}$. |
| 12. Divide $\frac{5}{9}$ of 4 by $4 \frac{5}{9}$. | <i>Ans.</i> $\frac{20}{41}$. |

The SINGLE RULE of THREE DIRECT in VULGAR FRACTIONS.

THE Operation of the Rule of Three in Fractions, is exactly agreeable to the Principles laid down in the same Rule in whole Numbers.

E X A M P L E S.

1. If $\frac{4}{5}$ of a lb. of Butter cost $\frac{7}{9}$ of a Shilling, what cost $\frac{1}{12}$ of a lb? *Ans.*

2. If

2. If $\frac{3}{4}$ of an Ell cost $\frac{2}{3}l$. what cost $\frac{1}{2}$ Ell?
Ans. 15s. 8d. $\frac{36}{111}$
3. If $\frac{4}{7}$ of an Ell cost $\frac{2}{3}$ of a Pound Sterling, what cost $\frac{1}{2}$ of an Ell?
Ans.
4. If $2\frac{1}{2}$ Ounces of Silver cost 15s. $\frac{1}{2}$, what is that per oz.
Ans.
5. If $\frac{4}{7}$ of an cwt. cost 5l. 16s. $\frac{1}{3}$, what must be given for $5\frac{1}{2}$ cwt.
Ans.
6. If 1 Dollar be worth 56 $\frac{1}{3}$, what are 5000 Dollars worth?
Ans. 179l. 3s. 4d.
7. If $\frac{3}{10}$ of an cwt. cost 14 $\frac{1}{2}l$. what will $7\frac{1}{2}$ cwt. cost at the same Rate?
Ans. 118l. 6s. 8d.
8. If $\frac{1}{12}$ of an cwt. cost 10s. $\frac{1}{6}$ what cost 1 $\frac{1}{2}$ cwt.
Ans.
9. If 1 Yard of Broad Cloth cost 15s. $\frac{5}{8}$, what will 4 Pieces each containing 27 Yards $\frac{3}{8}$ cost?
Ans. 85l. 10s. 11 $\frac{1}{2}d$.
10. If $6\frac{1}{2}$ Yards cost $\frac{9}{10}l$. what cost $9\frac{1}{2}$ yards?
Ans. 1l. 5s. 7 $\frac{1}{2}d$. $\frac{22}{11}$
11. If $\frac{1}{13}$ lb. of Sugar cost $\frac{7}{13}$ of a Shilling, what cost $\frac{3}{4}$ lb.?
Ans. 4 $\frac{1}{2}d$. $\frac{497}{111}$
12. If 1cwt. 2qr. 16lb. 14oz. 2 $\frac{7}{8}dr$. cost 1l. 1s. 5 $\frac{1}{2}d$. what cost 3cwt. 1qr. 5lb. 12oz. 5 $\frac{1}{2}dr$. $\frac{1}{4}$
Ans. 2l. 2s. 10 $\frac{4}{7}d$.

DECIMAL FRACTIONS.

DECIMAL Fractions are well known to be exceeding useful, both in Arithmetic, Mensuration, and many practical Parts of the Mathematics, and is known by having a Dot placed before it thus .5, stands for $\frac{5}{10}$ or five tenths, that is, if an Unit; for instance, if one Pound be divided into 10 equal Parts, the decimal Expression for 5 of those Parts, or 10
H Shil-

Shillings is .5. Again .57 stands for $\frac{57}{100}$, that is, the Integer is supposed to be divided into 100 equal Parts, and .57 stands for 57 of those Parts.

In general, the Value of a Decimal Figure is ten times less for every removal from the Dot or Period towards the right Hand, thus, in the Decimal .7777, &c. the 7 immediately after the Dot, is $\frac{7}{10}$, the next is $\frac{7}{100}$, the next is $\frac{7}{1000}$, &c.

9	C	Thousandth Parts
5	X	Thousandth Parts
4		Thousandth Parts
3		Hundredth Parts
2		Tenth Parts
1		Units
		Tens
3		Hundreds
4		Thousands
5	X	Of Thousands
9	C	Of Thousands

From which it appears, that as whole Numbers increase in a tenfold Proportion to the left Hand, so Decimals decrease in the same Proportion to the right Hand.

ADDITION of DECIMALS.

R U L E.

Set down the Numbers to be added directly underneath those of the same Value, whether they be mixed Numbers,

bers, or pure Decimals, which is done by paying a proper Regard to the Points as in the following Example.

$$\begin{array}{r}
 14 \cdot 75 \\
 1 \cdot 46145 \\
 7 \cdot 12406 \\
 174 \cdot 5 \\
 1 \cdot 4 \\
 \hline
 199 \cdot 23551
 \end{array}$$

Add .10074 to .74 to .0056 to 4.678 to 7.41 to 84.656 to .01 to 4.607.

As Addition of Decimals is so extremely easy, it is unnecessary to shew any great Number of Examples.

SUBTRACTION of DECIMALS.

R U L E.

The same Care must be taken in placing the Numbers as was observed in Addition, and the Operation is performed the same as in Subtraction of whole Numbers.

E X A M P L E.

$$\begin{array}{r}
 \text{From} \quad 1.456 \\
 \text{Take} \quad 1.16543 \\
 \hline
 \text{Rem.} \quad .29057
 \end{array}$$

H 2

From

From .27 take .174	From 1.4 take .9999
From .5 take .4444	From 4. take 2.45607

MULTIPLICATION of DECIMALS.

R U L E.

Multiply as in common Multiplication, and cut off as many in the Product, as there are in both Factors taken together.

E X A M P L E.

$$\begin{array}{r}
 \text{Multiply } 7.246 \\
 \text{By } 53.4 \\
 \hline
 28984 \\
 21738 \\
 36230 \\
 \hline
 386.9364
 \end{array}$$

1. Multiply .4541 by 5.4361
2. Multiply .00456 by .10167
3. Multiply .416 by 467.
4. Multiply .0007 by .1714156

Note. When Decimal Places are wanting, supply the Defect with Cyphers to the left Hand.

D I-

D I V I S I O N of D E C I M A L S.

R U L E.

Perform the Operation in the same Manner as in common Division, and cut off as many Decimals as the Dividend contains more than the Divisor, that is, if there are 3 places of Decimals in the Divisor, and 5 in the Dividend, the Difference is 2, which must be cut off.

Note 1. If there are as many Decimal Places in the Divisor as in the Dividend, the Quotient will be a whole Number.

Note 2. If there are not so many places of Decimals in the Dividend as in the Divisor, the Defect must be supplied with Cyphers.

E X A M P L E S.

Divide 386.9364 by 53.4 the Quotient is 7.246.

Divide 9858.66618 by 27.83 *Ans.* 354.246.

Divide 73.2 by 6.326. *Ans.* 11.5712.

Divide 1. by 282. and continue the Quotient to six Places. *Ans.* .003546.

Note 3. If there are not so many Figures in the Quotient as the Rule requires to be cut off, add Cyphers to the left Hand to supply the Defect.

REDUCTION of DECIMALS.

C A S E I.

To reduce a Vulgar Fraction to an equivalent Decimal.

RULE. Divide the Numerator by the Denominator, as in Division of Decimals, and the Quotient will be the Decimal required.

1. Reduce $\frac{1}{4}$ of a Pound Sterling to a Decimal.

$$\begin{array}{r} 4 \overline{) 1,00} \end{array}$$

.25 Answer

2. Reduce $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{2}{5}, \frac{5}{8}, \frac{7}{8}$, to Decimals.
3. Reduce $\frac{14}{17}, \frac{19}{20}, \frac{21}{22}, \frac{17}{19}, \frac{141}{444}$, and $\frac{99}{100}$, to Decimals.
4. Reduce $\frac{5}{19}, \frac{4}{21}, \frac{71}{192}, \frac{144}{139}$, and $\frac{7486}{11111}$, to Decimals.
5. Reduce 7s. 6d. to the Decimal of a Pound.
Ans. .375l.
6. Reduce 10s. 9½d. to the Decimal of a Pound.
Ans. .5385416+
7. Reduce 12 Grains to the Decimal of a Pound Troy.
Ans. .002083.
8. Reduce 12 Drams to the Decimal of a Pound Avoirdupois.
Ans. .046875.
9. Reduce 2 Quarters 14 Pounds to the Decimal of an cwt.
Ans. .625.
10. Reduce 4 Inches to the Decimal of a Yard.
Ans. .111111+
11. Reduce 3 Quarters 2 Nails to the Decimal of a Yard.
Ans. .875.
12. Re-

12. Reduce 4 Perches to the Decimal of an Acre.
Ans. .025.
13. Reduce 1 Pint to the Decimal of a Gallon.
Ans. .125.
14. Reduce 3 Gallons of Wine to the Decimal of a Hoghead.
.047619.
15. Reduce 2 Days to the Decimal of a Week.
Ans. .2857142 +.
16. Reduce 52 Days to the Decimal of a Year.
Ans. .142465 +.

C A S E II.

To find the Value of any Decimal Fraction in the known Parts of an Integer.

RULE. Multiply by the Denominative Parts of the Integer, and cut off to the right at each Multiplication as many Figures as the given Decimal contains, and the Figures on the left express the Value.

E X A M P L E S.

1. Required the Value of .39375 of a Pound Sterling.

$$\begin{array}{r}
 .39375 \\
 \times 20 \\
 \hline
 7.87500 \\
 \times 12 \\
 \hline
 10.50000 \\
 \times 4 \\
 \hline
 2.00000
 \end{array}$$

Ans. 7s. 10½d.

The

The given Decimal may be expressed $\frac{39375}{100000}$, hence the reason of cutting off five Figures, for it is in effect to divide by 100000.

2. Required the Value of .4875 of a Pound?

Ans. 9s. 9d.

3. Required the Value of .75 of a Pound?

Ans. 15s.

4. Required the Value of .00625 of a Pound?

Ans. $1\frac{1}{2}$ d.

5. How many Pence and Farthings are in .375 of a Shilling?

Ans. $4\frac{1}{2}$ d.

6. How many Farthings are in .75 of a Penny?

Ans. $\frac{3}{4}$ qr.

7. Required the Value of .4375 of a Guinea?

Ans. 9s. $2\frac{1}{2}$ d.

8. Required the Value of .46875 of a Tun.

Ans. 9cwt. 1qr. 14lb.

9. What is the Value of .625 of a Gallon?

Ans. 2qrts. and 1pt.

10. What is the Value of .071428 of a Hoghead of Wine?

Ans. 4gal. 1qrt. and .999856 remains

11. How many Roods and Poles are in .7354 of an Acre?

Ans. 2rds. 37po. and .664 remains.

12. How many Days are in .575 of a Year?

Ans. 209, and .875 of a Day.

The RULE of THREE in DECIMALS.

1. IF 1.25 Pound of Tea cost .4166l. what cost 35.125 Pound?

Ans. 11l. 4s. $1\frac{1}{2}$ d. 2016 remains.

2. What will the Pay of 540 Men come to at 5s. 5. per Man?

Ans. 688.5l.

3. If

3. If 7.75 Yards of Cloth cost 2*l.* 12.75*s.* what will 140.5 Yards cost? *Ans.* 47*l.* 16*s.* 3*bd.*

4. If a Chest of Sugar, weighing 7 Hundred weight, 2 Quarters, 14 Pound, cost 36*l.* 12.75*s.* what will 2 Hundred weight, 1 Quarter 21 Pounds come to at the same Rate? *Ans.* 11*l.* 14*s.* 2*d.* 3.5*qrs.*

5. If 1 Pint of Wine cost 1.2*s.* what cost 12.5 Hogheads? *Ans.* 378*l.*

6. What will 326.25 Pound of Tobacco come to when 1.5 Pound is sold for 3.5*s.*

Ans. 38*l.* 11*s.* 3*d.*

7. If 1 Yard of Cloth cost 12.3*s.* what cost 3 Pieces, each 21.5 Yards? *Ans.* 39*l.* 13*s.* 4*bd.*

8. A Man bought a Piece of Cloth for 6*l.* 13.12*s.* I demand how many Yards it contained when he gave after the Rate of 4*s.* 2.9*d.* for one Yard?

Ans. 31.3836*yds.*

9. If 2 Ounces of Silver cost 11*s.* what is the Price of a Tankard that weighs 1*lb.* 10 *oz.* 10*dwt.* 4*gr.*?

Ans. 6*l.* 3*s.* 9*d.* 2.2*qrs.*

10. If 1*lb.* of Tobacco cost 1.25*s.* what cost 3 Hogheads, weighing together 15*cwt.* 1*qr.* 19*lb.*?

Ans. 107*l.* 18*s.* 9*d.*

11. If I gave 15. 1*d.* for 3.5*lb.* of Cheese, what cost 112*lb.*?

Ans. 1*l.* 14*s.* 8*d.*

12. Bought 29.25*lb.* of Coffee for 10*l.* 11.25*s.* what is the Value of 15*lb.*?

Ans. 10*s.* 10*d.*

13. If 1.2*lb.* cost 10.4 of a Shilling, what cost 144.9*lb.*?

Ans.

14. If 21 Gallons of Rum cost 10.2*l.* what cost 1.5 Gallons?

Ans.

15. If 74.4 Yards of Cloth cost 49.9*l.* what cost one English Ell?

Ans.

16. If 17.7 Ells cost 16.5*l.* what cost 3.27 Ells?

Ans.

S I M P L E I N T E R E S T.

WHEN Money is lent, that Premium or Reward which is given for the Loan of it, is called Interest.

Simple Interest is, when the Interest is received as it becomes due; or when allowed to remain in the Borrowers Hands without paying for it.

The Sum lent is the Principal; the Rate is the Interest of 100*l.* for one Year. The Amount is the Sum of the Principal and Interest.

C A S E I.

Given the Principal Rate and Time to find the Interest.

RULE. As 100*l.* is to the Rate per Cent. for one Year, so is the Principal to the Interest for one Year; which multiplied by the Time, produces the Interest.

Or multiply the principal Rate and Time, and divide their Product by 100, which is done by cutting off two Figures in the Product.

E X A M P L E S.

What is the Interest of 750*l.* at 5 per Cent. for 8 Years.

R U L E I.

As 100*l.*... 5*l.* :: 750*l.*... 37*l.* 5*s.* which multiplied by 8, give the Answer.

R U L E

R U L E II.

$$\frac{750 \times 5 \times 8}{100} = 300\text{.} \quad \text{The Answer.}$$

2. Required the Interest of 655*l.* for 3 Years at 4 per Cent. per Annum. *Ans.* 78.6 = 78*l.* 12*s.*
3. What is the Interest of 110*l.* for 2 Years at 4 per Cent. per Annum? *Ans.* 8*l.* 16*s.*
4. What is the Interest of 76*l.* for 4 Years at 5 per Cent. per Annum? *Ans.* 15*l.* 4*s.*
5. What is the Amount of 400*l.* for 12 Years at 6 per Cent. per Annum? *Ans.* 688*l.*
6. If 100*l.* in one Year gives 5*l.* Interest, what will 486*l.* yield in 5 Years? *Ans.* 121*l.* 10*s.*

C O M M I S S I O N.

COMMISSION is an Allowance from Merchants to their Factors or Agents in the buying or selling of any sort of Goods; and is a certain Rate per Cent. according to the Custom of the Country where the Factor resides.

E X A M P L E S.

My Factor sends me word that he has bought Goods to the Value of 500*l.* 13*s.* 6*d.* upon my Account; I demand his Commission at $3\frac{1}{2}$ per Cent.?

Ans. 17*l.* 10*s.* 5*½d.* $\frac{68}{100}$.
My

My Correspondent has disbursed on my Account, the Sum of 100*g*l. 18*s*. what is his Commission at $2\frac{1}{4}$ per Cent.?

Ans. 22*l*. 14*s*. 5*d*. 1*qr*. $\frac{8}{100}$.

Suppose I allow my Correspondent $1\frac{1}{4}$ per Cent. for Provision, what may he demand on the Disbursement of 704*l*. 15*s*. 4*d*.

Ans. 12*l*. 6*s*. 8*d*. $\frac{3}{100}$.

C A S E II.

When the Time consists of $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$.

RULE. Multiply the Interest of one Year by the Number of Years, and take Parts for $\frac{1}{4}$, $\frac{1}{2}$, &c. add them together, and you have the Answer.

E X A M P L E S.

1. What is the Interest of 200*l*. for $3\frac{1}{2}$ Years at 5 per Cent. per Annum?

200	$\frac{1}{2}$	$\frac{1}{2}$	10
5			3
<hr/>			<hr/>
10 00			30
			5
			<hr/>
			35 Pounds the Answer.

2. What is the Interest of 464*l*. 16*s*. $6\frac{1}{2}$ *d*. for 1 Year and $\frac{3}{4}$, at 6 per Cent. per Annum.

Ans.

3. What is the Interest of 70*l*. 14*s*. 6*d*. for 2 and $\frac{1}{4}$ Years at 4 per Cent. per Annum?

Ans.

4. What

4. What is the Amount of 468*l.* 12*s.* 4*d.* for 1 Year and $\frac{3}{4}$ at 6 per Cent. per Annum? *Ans.* 517*l.* 16*s.* 5*d.*

5. What is the Interest of 1000*l.* for 2 Years and $\frac{3}{4}$, at 4 per Cent. per Annum? *Ans.* 110*l.*

B R O K A G E

IS an Allowance made to Persons called Brokers, at a certain Rate per Cent. for finding Customers, and selling to them the Goods of other Men.

RULE. Divide the given Sum by 100, and take Parts from the Quotient for the Rate per Cent.

E X A M P L E S.

What is the Brokage of 549*l.* at 4 Shillings per Cent.?

6	49	<i>s.</i>	$\frac{1}{5}$	6	9	$9\frac{1}{2}$	
	20	4		1	5	$11\frac{1}{2}$	
9	80						Answer
	12						
9	60						
	4						
2	40						

What may a Broker demand for Brokage when he sells Goods to the Value of 500*l.* 10*s.* $7\frac{1}{2}$ *d.*

Ans.

I

What.

What may a Broker demand who sells Goods to the Value of 749*l.* 19*s.* *Ans.*

Note. If the Brokage should be one or more per Cent. the Operation will be the same with that in Factors Allowances.

C A S E III.

When the Rate per Cent. is $\frac{1}{2}$, $\frac{1}{4}$, or $\frac{3}{4}$ more than the Pounds given in the said Rate.

RULE. Multiply the Principal by the Pounds, and take Parts for the $\frac{1}{2}$, $\frac{1}{4}$, or $\frac{3}{4}$, add them together, and proceed as before.

E X A M P L E S.

1. What is the Interest of 400*l.* for 2 Years at $5\frac{1}{2}$ per Cent. per Annum? *Ans.* 44*l.*

2. What is the Interest of 120*l.* for one Year at $4\frac{1}{2}$ per Cent. per Annum? *Ans.* 5*l.* 8*s.*

3. What is the Amount of 690*l.* for 3 Years, at $4\frac{1}{2}$ per Cent. per Annum? *Ans.* 777*l.* 19*s.* 6*d.*

4. What is the Amount of 479*l.* 16*s.* 9*d.* for 5 Years and $\frac{1}{2}$, at $4\frac{1}{2}$ per Cent. per Annum? *Ans.*

C A S E IV.

To find the Interest of any Sum for a certain Number of Weeks, say as 52 Weeks are to the Interest of the given

given Sum for a Year; so are the Weeks given to the Interest required.

1. What is the Interest of 120*l.* for 5 Weeks at 5 per Cent. per Annum? *Ans.*

2. What is the Interest of 174*l.* 10*s.* for 51 Weeks at 4½ per Cent. per Annum?

3. What is the Amount of 500*l.* for 4 Weeks at 5 per Cent. per Annum?

C A S E V.

To find the Interest for any Number of Days say.

As 365 Days are to the Interest of the given Sum for a Year; so are the Days given to the Interest required.

E X A M P L E S.

1. What is the Interest of 400*l.* 10*s.* 6*d.* for 20 Days at 5 per Cent. per Annum. *Ans.*

2. What is the Interest of 126*l.* for 145 Days at 6 per Cent. per Annum? *Ans.* 3*l.* 0*s.* 0*d.* 3*qrs.* 187.

3. What is the Interest of 100*l.* for 34 Days at 4½ per Cent. per Annum? *Ans.*

4. What is the Amount of 34*l.* 10*s.* for 44 Days at 4½ per Cent. per Annum? *Ans.*

5. What is the Amount of 46*l.* for 30 Days at 4½ per Cent. per Annum? *Ans.*

C A S E VI.

Given the Amount, Time and Rate per Cent. to find the Principal.

RULE. As the Amount of 100*l.* at the Rate and Time given, is to 100*l.* so is the Amount given, to the Principal required.

E X A M P L E S.

1. What Principal will Amount to 750*l.* in 2 Years at 4 per Cent. per Annum? *Ans.* 694*l.* 8*s.* 10*d.* $\frac{2}{3}$.

2. What Principal being put to Interest for 7 Years, will amount to 793*l.* 12*s.* at 4 per Cent. per Annum? *Ans.* 620*l.*

C A S E VII.

Given the Amount, Time and Principal to find the Rate per Cent.

RULE. As the Principal is to the Interest for the whole Time; so is 100*l.* to its Interest for the same Time. Divide the Interest last found by the Time, and the Quotient will be the Rate per Cent.

E X A M P L E S.

1. At what Rate per Cent. will 500*l.* amount to 725*l.* in 9 Years. *Ans.* 5 per Cent.

2. At what Rate per Cent. will 420*l.* Amount to 520*l.* 16*s.* in 8 Years? *Ans.* 3 per Cent.

C A S E VIII.

Given the Principal, Amount, and Rate per Cent. to find the Time.

RULE.

RULE. As the Interest of the Principal for one Year at the given Rate is to one Year ; so is the whole Interest to the Time required.

1. In what Time will 500*l.* amount to 725*l.* at 5 per Cent. per Annum ? *Ans.* 9 Years.

2. In what Time will 420*l.* amount to 520*l.* 16*s.* at 3 per Cent. per Annum ? *Ans.* 8 Years.

COMPOUND INTEREST.

COMPOUND INTEREST is that which arises, from the Interest being added to the Principal ; and, continued in the Hands of the Borrower, becomes a Part of the Principal at the End of each stated Time of Payment.

RULE. Find the Amount of the given Principal for the Time of the first Payment, by Simple Interest ; next find the Interest of that Sum or Principal, and add it as before ; and thus proceed for any Number of Years, &c. The given Principal being subtracted from the last Amount, the Remainder will be the Compound Interest. Or, find the Amount of 1 Pound for the Time of the first Payment, and multiply it by itself, as often as there are Times of Payment, less by one ; that is, twice by itself if there be three Payments, thrice if there be four, &c.—this last Product and the Principal multiplied together, the Product will be the whole Amount : Or, seek in the following Table for the Amount of 1 Pound at the Rate and Time given, which being multiplied into the Principal, the Product will be the Amount, that is, the Compound Interest and Principal together.

N. B. The Times of Payments, whether yearly, monthly, &c. must be equal.

The following Tables shew the Amount of one Pound, at the Rates of $3\frac{1}{2}$, 4, 5, and 6*l.* per Cent. per Annum, from 1 Year to 20.

1. A Table of the Amount of 1*l.* at $3\frac{1}{2}$ *l.* and 4*l.* per Cent.

$3\frac{1}{2}$ RATES. 4.			$3\frac{1}{2}$ RATES. 4.		
years.	l. dec. prts.	l. dec. prts.	years.	l. dec. prts.	l. dec. prts.
1	1,035	1,04	11	1,45996	1,53945
2	1,07122	1,0816	12	1,51106	1,60103
3	1,10871	1,12486	13	1,56395	1,66507
4	1,14752	1,16986	14	1,61068	1,73167
5	1,18768	1,21665	15	1,67533	1,70094
6	1,22925	1,26531	16	1,73397	1,87298
7	1,27227	1,31593	17	1,79466	1,94790
8	1,31681	1,36856	18	1,85747	2,02581
9	1,36289	1,42331	19	1,92248	2,10684
10	1,41059	1,48024	20	1,98977	2,19112

2. A Table of the Amount of 1*l.* at 5*l.* and 6*l.* per Cent.

5. RATES. 6.			5. RATES. 6.		
years.	l. dec. prts.	l. dec. prts.	years.	l. dec. prts.	l. dec. prts.
1	1,05	1,06	11	1,71033	1,89829
2	1,1025	1,1236	12	1,79585	2,01219
3	1,15762	1,19101	13	1,88564	2,13292
4	1,2155	1,26247	14	1,97993	2,2609
5	1,27628	1,33822	15	2,07892	2,39655
6	1,34009	1,41851	16	2,18287	2,54053
7	1,4071	1,50363	17	2,29201	2,69277
8	1,47745	1,59384	18	2,40661	2,85433
9	1,55132	1,68947	19	2,52695	3,02559
10	1,62889	1,79084	20	2,65329	3,20713

N. B. In

N. B. In finding the Amount of $\text{1}l.$ for 1 Year, at the above Rates per Cent. the following Proportions were used, viz.

$l.$	$l.$	$l.$	$l.$	$l.$	$l.$	$l.$	$l.$
As 100 : 103,5 :: 1 : 1,035	As 100 : 104 :: 1 : 1,04						
As 100 : 105 :: 1 : 1,05	As 100 : 106 :: 1 : 1,06						

EXAMPLES.

1. What will the Compound Interest of $370l.$ Amount to in 6 Years, at $4l.$ per Cent. per Annum?

Ans. $98l. 3s. 4\frac{1}{2}d.$

2. What will $50l.$ amount to in 1 Year, at $5l.$ per Cent. per Annum, payable every 2 Months?

Ans. $52l. 11s. 0\frac{1}{4}d.$

3. What will $200l.$ amount to in 5 Years, at $4l.$ per Cent. per Annum, Compound Interest?

Ans. $243l. 6s. 7\frac{1}{2}d.$

REBATE OR DISCOUNT.

THE Rebate or Discount of any Sum of Money, is the Difference between its present Value, and that due at any time to come.

The present Value of $50l.$ due six Months hence, calculated at $5l.$ per Cent. per Annum, is only $48l. 15s. 7\frac{1}{2}d.$ because if $48l. 15s. 7\frac{1}{2}d.$ were to be placed out at Interest for 6 Months, at $5l.$ per Cent. per Annum, its Amount would then be $50l.$

RULE. As the Amount of $100l.$ for the given Rate and Time, is to $100l.$ or the Interest of $100l.$ for the given

given Time; so is the given Sum or Debt, to the present Worth, or Discount of the given Sum.

E X A M P L E S.

1. What is the present Value of 40*l.* due 2 Months hence, Discount at 5*l.* per Cent. per Annum?

Ans. 39*l.* 13*s.* 4½ ¹⁵/₄ ⁶/₄.

<i>m.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	
12 ½	5	0	0	The Interest of 100 <i>l.</i> for 1 Year.

0 16 8 Ditto of 100*l.* for 2 Months.

Add 100 0 0

The sum is 100 16 8 The Amount of 100*l.* at the given Rate and Time.

The Sum given is 40*l.* Then, by the Rule, the stating will be as follows:

As 100*l.* 16*s.* 8*d.* :: 100*l.* :: 40*l.* : the present Value.

Ans. 39*l.* :: 13 : 4½ ¹⁵/₄ ⁶/₄.

2. What is the present Value of 27*l.* 10*s.* 6*d.* for 7 Months, at 4½ per Cent. per Annum?

Ans. 26*l.* 11*s.* 7*d.* ³⁶³/₂₄₆₃.

3. How much present Money will pay a Debt of 76*l.* 5*s.* due 1 Year hence, 5 per Cent. being allowed for present Payment.

Ans. 72*s.*

4. A Legacy of 7000*l.* is to be paid in 2 Years, but the Person to whom it is left, agrees to sell it for ready Money, allowing 4½ per Cent. Discount, how much must he receive at present?

Ans. 6422*l.* 0*s.* 4*d.* ¹⁴⁴/₁₀₀.

5. How much present Money will pay a Bill of 300*l.* due in 3 Months, at 5 per Cent.?

Ans. 296*l.* 5*s.* 11*d.*

E Q U A

EQUATION OF PAYMENTS.

WHEN Sums are due at different Periods, the Time for the Payment of the Whole is determined by Equation of Payments.

COMMON WAY.

Multiply each Sum by the Time of its becoming payable, and divide the Amount of these Products by the Sum of the Payments.

The TRUE WAY.

Find the Value of each Payment for its respective Time as in Rebate. Compute in what Time the Sum of these present Values will amount to the Total of the Payments.

EXAMPLES.

1. A. has 200*l.* to pay in 4 Months; 600*l.* in 6 Months; and 400*l.* in 9 Months. But he chuses to pay the Whole at once. When must that be?

$$4 \times 200 = 800$$

$$6 \times 600 = 3600$$

$$9 \times 400 = 3600$$

$$\begin{array}{r} 1200 \end{array} \begin{array}{r} 8000 \end{array}$$

$6\frac{2}{3}$ Months.

2. In

2. In 2 Months 72*l.* is due; in 8 Months 24*l.*; and 60*l.* in 12 Months. If the Whole be paid together, in what Time must the Payment be made.

Ans. 6 $\frac{10}{13}$ Months.

ANNUITIES at SIMPLE INTEREST.

TO find the Amount of any Annuity, or yearly Sum.

RULE. Multiply the Interest of 1*l.* in 1 Year, by the Annuity, and the Product by the Number of Years less 1. Add twice the Annuity to the last Product, and multiply the Sum, by Half the Number of Years,

E X A M P L E S.

1. Required the Amount of an Annuity of 80*l.* for 6 Years, at 5 per Cent. Simple Interest?

.05 Interest of 1*l.* in 1 Year
80 Annuity

4.00

5 Number of Years less 1

20

160 Twice the Annuity

180

3 Half Number of Years

540

Pounds the Amount.

2. Re-

2. Required the Amount of an Annuity of 72*l.* 10*s.* forborn 7 Years, at $4\frac{1}{2}$ per Cent. Simple Interest?

Ans. 618*l.* 0*s.* 3*d.*

ANNUITIES at COMPOUND INTEREST.

C A S E I.

TO find the Amount of any Annuity at Compound Interest.

RULE. Multiply the Amount of 1*l.* in 1 Year, as often into itself, as there are Years. Subtract 1 from the last Product. Divide the Remainder by the Interest of 1*l.* in 1 Year; and multiply the Quotient by the Annuity.

E X A M P L E S.

1. Required the Amount of an Annuity of 50*l.* in 4 Years at 5 per Cent. Compound Interest?

The Amount of 1*l.* in 1 Year at 5 per Cent. is 1.05.

The Interest of 1*l.* in 1 Year is .05.

$$1.05 \times 1.05 \times 1.05 \times 1.05 = 1.21550625.$$

$$1.21550625 - 1.$$

$$\text{-----} \times 50 = 215.50625*l.* = 215*l.* 10*s.* 12*d.*$$

.05

2. What is the Amount of an Annuity of 240*l.* in 6 Years at 4 per Cent. *Ans.* 1591*l.* 18*s.* 3*d.*

3. What is the Amount of an Annuity of 20*l.* in 8 Years at $4\frac{1}{2}$ per Cent? *Ans.* 187*l.* 12*s.*

It is easy to conceive, that by this Rule, Tables may be computed to shew the Amount of 1*l.* at any Rate, for

for any Number of Years. The Amount of 1*l.* multiplied by the Annuity, will readily give the Amount of the Annuity.

A Table shewing the Amount of 1*l.* Annuity at 5 per Cent. as far as 21 Years. Compound Interest.

Years.	Amount.	Years.	Amount.	Years.	Amount.
1	1.000000	8	9.549109	15	21.578564
2	2.05	9	11.026564	16	23.657491
3	3.1525	10	12.577892	17	25.840366
4	4.310125	11	14.206787	18	28.132384
5	5.525631	12	15.917126	19	30.539003
6	6.801913	13	17.712982	20	33.065954
7	8.142008	14	19.598632	21	35.719252

EXAMPLES by the TABLE.

1. Required the Amount of an Annuity of 200*l.* forborn 16 Years at 5 per Cent. Compound Interest?

$$23.657491 \times 200 = 4731.4982 = 4731*l.* 9*s.* 11½*d.*$$

2. Required the Amount of an Annuity of 60*l.* 5*s.* in 10 Years, at 5 per. Cent. ? *Ans.* 757*l.* 16*s.* 4½*d.*

C A S E II.

To find the present Worth of an Annuity which has to continue a given time, Compound Interest being allowed for purchase Money.

RULE.

RULE. Multiply the Amount of *1*l. in 1 Year, as often by itself as there are Years; and divide the Annuity by the Product. Subtract the Quotient from the Annuity; and divide the Remainder by the Interest of *1*l. in 1 Year.

E X A M P L E S.

1. What is the present Worth of an Annuity of 50*l.* to continue 6 Years at 5 per Cent. Compound Interest?

$$\begin{array}{l}
 1.05 \text{ multiplied } 6 \text{ Times by itself, produces} \\
 1.3400956+ \\
 1.3400956) 50. (37.31077 \\
 \underline{50 - 37.31077} \\
 = 253.78461. = 253\text{ }l. \text{ } 15\text{ }s. \text{ } 8\frac{1}{2}\text{ }d.
 \end{array}$$

.05

2. A Person has an Annuity of 60*l.* certain for 4 Years, which he would sell at present, and allow the Purchaser 5 per Cent. Compound Interest; what Sum must be given for it? *Ans.* 212*l.* 15*s.* 1½*d.*

But the present Worth of any Annuity is much more readily found by Tables that contain the present Worth of *1*l. Annuity, computed by the above Rule.

A Table containing the present Worth of *1*l. Annuity as far as 21 Years at 5 per Cent. Compound Interest.

Years.	Pt. Worth.	Years.	Pt. Worth.	Years.	Pt. Worth.
1	.952381	8	6.463213	15	10.379658
2	1.859410	9	7.107821	16	10.837770
3	2.723248	10	7.721735	17	11.274066
4	3.545950	11	8.306414	18	11.689587
5	4.329476	12	8.863251	19	12.085321
6	5.075692	13	9.393573	20	12.462210
7	5.786373	14	9.898641	21	12.821153

EXAMPLES by the TABLE.

1. What is the present Worth of an Annuity of 32*l.* at 5 per Cent. to continue 20 Years?

$$12.462210 \times 32 = 398.79072 \approx 398*l.* 15*s.* 9\frac{1}{2}*d.*$$

2. What is the present Worth of an Annuity of 100*l.* at 5 per Cent. to continue 9 Years?

$$\text{Ans. } 710*l.* 15*s.* 7\frac{1}{2}*d.*$$

When the Annuity is payable half yearly, the Amount of 1*l.* for half a Year, must be multiplied twice as often by itself, as there are Years, and half the Annuity must be used instead of the Whole. In quarterly Payments, the Amount of 1*l.* in one Quarter must be multiplied four Times as often as there are Years, and one-fourth of the Annuity must be taken.

1. What is the present Worth of an Annuity of 100*l.* payable half yearly, for 4 Years at 5 per Cent?

$$\text{Ans. } 358*l.* 10*s.* 1\frac{1}{2}*d.*$$

2. What is the present Worth of an Annuity of 80*l.* payable quarterly for 3 Years, at 4 per Cent?

$$\text{Ans. } 225*l.* 2*s.* 0\frac{1}{2}*d.*$$

C A S E III.

To find the present Worth of a Reversionary Annuity, that is, of one which does not commence until a future Period.

RULE. Find the Value of the Annuity according to the Time and Rate, by Case II. without any regard to the Time of its Commencement, and call it A.

Mut.

Multiply the Amount of 1*l.* in 1 Year, as often by itself as there are Years before the Commencement of the Annuity, and divide the Value A. by the Product.

E X A M P L E S.

1. What is the present Worth of an Annuity of 30*l.* to continue 4 Years, but not to commence until the End of 3 Years from the Time of paying the purchase Money?

By the present Worth Table $3.54595 \times 30 = 106.3785 = A$, the Value of the Annuity at the Time of commencing. Then 106.3785

$$\frac{106.3785}{1.05 \times 1.05 \times 1.05} = 91.8937*l.* = 91*l.*$$

17*s.* 10½*d.*

2. What Sum must be given for an Annuity of 120*l.* to continue 6 Years, at 4 per Cent. but not to commence until the End of 3 Years? *Ans.* 559*l.* 4*s.* 6½*d.*

C A S E IV.

To find the Value of a Freehold Estate, or Annuity to continue for ever.

RULE. Divide 100 Times the Annual Value, by the Rate.

E X A M P L E S.

1. What Sum must be given for an Estate of 2000*l.* per Annum at 5 per Cent. Compound Interest?

$$\frac{2000 \times 100}{5} = 40000*l.*$$

2. Required the present Worth of an Estate of 325*l.* 12*s.* 6*d.* per Annum at 4 per Cent.?

Ans. 8140*l.* 12*s.* 6*d.*

3. A Gentleman in 4 Years will be in Possession of an Estate of 600*l.* per Annum; what is it worth at present at 5 per Cent.?

Ans. 9872*l.* 8*s.* 5½*d.*

C A S E V.

To find the present Worth of a Life Annuity.

RULE. Multiply the Annuity by the Number against the Age, in the following Table.

Age.	At 5 per Cent.	Age.	At 5 per Cent.	Age.	At 5 per Cent.	Age.	At 5 per Cent.
6	14.1	24	12.4	42	10.1	60	7.9
8	14.3	26	12.1	44	9.9	62	7.6
10	14.3	28	11.8	46	9.7	64	7.3
12	14.2	30	11.6	48	9.4	66	6.9
14	14.0	32	11.3	50	9.2	68	6.6
16	13.7	34	11.0	52	8.9	70	6.2
18	13.4	36	10.8	54	8.6	72	5.8
20	13.0	38	10.5	56	8.4	74	5.4
22	12.7	40	10.3	58	8.1	75	5.2

E X A M P L E S.

1. A Gentleman aged 42, has an Annuity of 120*l.* which he would sell, and allow the Purchaser 5 per Cent. Compound Interest, how much must be given for it?

$$120 \times 10.1 = 1212*l.*$$

2. Re-

2. Required the present Worth of an Annuity of 50*l.* at 5 per Cent. belonging to a Person of 20 Years.

Ans. 585*l.*

If the Sum to be laid out, and the Age be given, divide the Sum by the tabular Number, and the Quotient is the Annuity.

E X A M P L E S.

1. A Person aged 36, wishes to lay out 1000*l.* for an Annuity, how much will it procure at 5 per Cent.?

$$\frac{100}{10.8} = 92.59259 = 92*l.* 11*s.* 10½*d.*$$

2. What Annuity will 600*l.* purchase at 5 per Cent. to a Person of 56 Years of Age? *Ans.* 714*l.* 5*s.* 8½*d.*

S I N G L E F E L L O W S H I P.

SINGLE Fellowship is when the several Sums put in by the Partners are all continued the same time. It may be performed three Ways.

RULE 1. As the whole Stock : the Gain or Loss :: Any Share : the Gain or Loss belonging to it.

RULE. Divide the Gain or Loss by the Stock, and multiply the Quotient into each Share.

RULE 3. Divide the Stock by the Gain and Loss, and divide each Share by the Quotient.

E X A M P L E S.

1. A. B. and C. Trade in Company. A. put in 640*l.* B. 960*l.* and C. 1024*l.* The Gain was 656*l.* Required the Gain for each?

$$\begin{array}{r}
 640 \\
 960 \\
 1024 \\
 \hline
 2624 \quad \text{Stock} \\
 \hline
 \end{array}$$

By RULE 1.

$$\begin{array}{l}
 \text{As } 2624 : 656 :: 640 : 160\text{i}l. \text{ A's Gain.} \\
 \text{As } 2624 : 656 :: 960 : 240\text{i}l. \text{ B's Gain.} \\
 \text{As } 2624 : 656 :: 1024 : 256\text{i}l. \text{ C's Gain.}
 \end{array}$$

By RULE 2. $\frac{656}{2624} = .25$, then $640 \times .25 = 160\text{i}l.$ A's

Gain; $960 \times .25 = 240\text{i}l.$ B's Gain; and $1024 \times .25 = 256\text{i}l.$ C's Gain.

By RULE 3. $\frac{2624}{656} = 4$; then $640 \div 4 = 160\text{i}l.$; $960 \div$

$4 = 240\text{i}l.$; and $1024 \div 4 = 256\text{i}l.$

2. A,

2. A, B, and C Trade in Company; A put in 28*l.* 12*s.* B 44*l.* 8*s.* and C 50*l.* 12*s.* They Gain 36*l.* 1*s.* how much Gain for each?

Ans. A 8*l.* 6*s.* 10*d.*; B 12*l.* 9*s.* and C 14*l.* 15*s.* 2*d.*

3. A Bankrupt owes to A 164*l.* 12*s.* to B 960*l.* 16*s.* and to C 2402*l.* 8*s.* His Estate is 1332*l.* 18*s.* 6*d.* how much will each Creditor receive?

Ans. A 61*l.* 14*s.* 6*d.* B 360*l.* 6*s.* and C 900*l.* 18*s.*

4. A, B, C, and D have 24*l.* to pay in Proportion to their Rents. The Rent of A is 248*l.*; B 132*l.*; C 310*l.* and D 390*l.*; how much must each pay?

Ans. A 5*l.* 10*s.* 2 $\frac{2}{3}$ *d.* B 2*l.* 18*s.* 8*d.* C 6*l.* 17*s.* 9 $\frac{1}{3}$ *d.* and D 8*l.* 13*s.* 4*d.*

COMPOUND FELLOWSHIP.

IF both the Sums, and the Time of employing them be different, it is Compound Fellowship.

RULE. Multiply each Sum by its Time, and with the Products as Shares, and the Gain, proceed by any of the three Rules in Single Fellowship.

EXAMPLES.

1. A, B, and C trade in Company. A had 60*l.* in trade 10 Months; B 100*l.* 8 Months, and C 180*l.* in 6 Months. They gain 124*l.*; how much is the Gain for each?

Ans. A 30*l.* B 40*l.* and C 54*l.*

2. A and B each put in 80*l.* In 4 Months A put in 100*l.* more, and 2 Months after that B put in 180*l.* more. They traded together in all 12 Months, at the

the End whereof their whole Stock was 570*l.* how much of it belongs to each of them?

Ans. To A 264*l.* and to B 306*l.*

ALLIGATION MEDIAL.

ALLIGATION Medial, is when Goods are mixed, and the Value of 1 of the Quantity after the mixture is wanted.

RULE. Find the Value of each Quantity mixed, and then divide the whole Value by the whole Quantity.

E X A M P L E S.

1. If 40 Gallons of Wine at 8*s.* be mixed with 60 Gallons at 12*s.* how much will 1 Gallon of the Mixture come to?

40 Gallons at 8 <i>s.</i> = 320	1040	
60 Gallons at 12 <i>s.</i> = 720	Then	= 10 <i>s.</i> 4 ⁴ / ₅ <i>d.</i>
100	1040	100

2. A Person mixes 120 Pounds of Tea at 8*s.*; 90 Pounds at 7*s.* 6*d.* and 180 Pounds at 6*s.* Required the Price of 1 Pound of the Mixture? *Ans.* 6*s.* 11²/₅*d.*

ALLIGATION ALTERNATE.

THIS is when the Prices and Composition are given, to find the several Parts.

RULE.

RULE. Bring all the Prices into one Denomination. Link a greater Price than the Mean, to one lesser than the Mean, until all the Prices are linked. Find the Differences between these Prices and the Mean, which place alternately.

As the Sum of these Differences : the Composition :: any particular Difference : the Number at the Price, opposite to that Difference.

E X A M P L E S.

1. What Number of Gallons at 10s. at 9s. 6d. at 8s. 4d. and at 6s. 8d. will constitute a Mixture of 162 Gallons at 9s. 4d. per Gallon?

$$\begin{array}{r|l}
 112 & \begin{array}{r} 120 \\ 114 \\ 100 \\ 80 \end{array} \end{array} \begin{array}{l} 32 \\ 12 \\ 2 \\ 8 \\ \hline 54 \end{array}$$

As 54 : 162 :: 32 : 96 Gallons at 10s.

54 : 162 :: 12 : 36 - - - at 9s. 6d.

54 : 162 :: 2 : 6 - - - at 8s. 4d.

54 : 162 :: 8 : 24 - - - at 6s. 8d.

2. How many Pounds at 6s. 8d. at 5s. 4d. at 4s. 6d. and at 4s. will make a Mixture of 330 Pounds at 4s. 8d. per Pound?

Ans. 44lb. 11lb. 11lb. 132lb. and 132lb.

B A R T E R.

WHEN Goods of one Kind are exchanged for Goods of another, they are said to be bartered.

RULE. Multiply the given Quantity by the Price of it, and divide the Product by the Price of the Quantity required.

E X A M P L E S.

1. How many Yards of Muslin at 9s. 30d. per Yard, must be given for 472 Yards of Cotton at 8s. 8d. per Yard?

$$\frac{472 \times 32}{118} = 128 \text{ Yards of Muslin.}$$

2. How many Gallons of Wine, at 9s. 6d. per Gallon, must be given for 3 Hundred 2 Quarters 14 Pound of Tea, at 7s. 6d. per Pound? *Ans.* 320 $\frac{10}{19}$ Gallons.

3. Two Men C and D Barter, C gives D 640 Gallons of Wine, at 6s. 8d. per Gallon, for which D gives C 512 Yards of Silk; what is the Value of 1 Yard of Silk?

4. A gives B 5 Hundred 2 Quarters 10 Pound of Rice, at 3 $\frac{1}{2}$ d. per Pound; one third of which is to be paid in ready Money, and the Remainder in Linen at 2s. 8 $\frac{1}{2}$ d per Yard, how much Linen must B give A?

Ans. 44yds. 3qr. 3 $\frac{12}{19}$ n.

5. L and M barter, L has Linen at 1s. 9 $\frac{1}{2}$ d. per Yard, but in Barter he will have 2s. 11 $\frac{1}{2}$ d. per Yard.

M has

M has Broad Cloth at 17s. 11d. per Yard, how must M rate his Broad Cloth in Barter, to advance it in Proportion to L's advance of his Linen, and how many Yards of Broad Cloth must M give for 675 Yards of Linen.

Ans. The Broad Cloth must be rated at 19s. 11d. and 67½ Yards of it given for the Linen?

6. A Merchant sends to Spain 1300 Pieces of Broad Cloth, each Piece 47 Yards; at 15s. 6d per Yard, to have in return from thence, the one half in Wine, at 65l. per Tun; the other half in Oranges, at 3l. 10s. per Chest; what Quantity of each will he receive?

Ans. 364t. 1hhd. Wine, and 6764 Chests of Oranges.

LOSS AND GAIN.

LOSS and Gain is best performed by dividing it into two Cases.

CASE I.

The buying and selling Prices given to find the Gain or Loss per Cent.

RULE. As the Price given for any Article, is to the Gain or Loss in the same Denomination; so is 100l. to the Gain or Loss in Pounds, &c.

EXAMPLES.

1. When Cotton is bought at 4s. 8d. per Yard, and sold for 6s. per Yard, what is the Gain per Cent.?
That

That is, if 100*l.* was laid out for Cotton, at 4*s.* 8*d.* per Yard, and that it was all sold at 6*s.* per Yard, what would the Gain be?

s. *d.*

6 0

4 8 = 56*d.*

1 4 = 16*d.* Gain by laying out 4*s.* 8*d.*

As 56*d.* : 16*d.* :: 100*l.* : 28*l.* 1*s.* 5¹/₇*d.*

2. Bought Tea at 6*s.* 6*d.* per Pound, and sold it at 7*s.* 3*d.* per Pound, how much is the Gain per Cent.?

Ans. 11*l.* 10*s.* 9¹/₃*d.*

3. If 5 Hundred 3 Quarters 16 Pound of Sugar cost 2*l.* 6*s.* 8*d.* per Hundred, and be sold at 6*d.* per Pound, what is the Gain or Loss by the Whole, and also per Cent.?

Ans. The whole Gain is 2*l.* 15*s.* and per Cent. 20*l.*

4. Bought 5 Pieces of Holland, each containing 56 Ells Flemish, at 3*s.* 2*d.* per Ell, what shall I gain in the Whole; and what per Cent. if I sell it for 5*s.* 8*d.* per Ell English?

Ans. the whole Gain 3*l.* 5*s.* 4*d.* and per Cent.

5. Bought 720 Yards Muslin at 6*s.* 6*d.* and sold it at 7*s.* 6*d.* At the same Time 480 Yards Cambric at 8*s.* 4*d.* which was sold for 9*s.* 8*d.* how much more was gained in the Whole by one Bargain, than by the other; and what was the Difference of the Gains per Cent.?

Ans. 4*l.* was gained more by the Muslin on the Whole than by the Cambric; but the Gain per Cent. was 12*s.* 3²/₁₃*d.* in favour of the Cambric.

C A S E II.

The buying Price, and Gain per Cent. given, to find the selling Price.

RULE. As 100*l.* : 100*l.* added to the proposed Gain : : the buying Price : the selling Price.

E X A M P L E S.

1. If Brandy be bought at 8*s.* per Gallon, how must it be sold to gain 12*l.* 10*s.* per Cent.?

As 100*l.* : 112.5*l.* : : 8*s.* : 9*s.*

2. When Sattin is bought for 7*s.* 6*d.* per Yard, how must it be sold to gain 10*l.* per Cent. *Ans.* 8*s.* 3*d.*

3. Bought 4 Hundred 2 Quarters 14 Pounds of Tea at 29*l.* 8*s.* per Hundred, and paid Charges on the Whole 25*l.* 18*s.* how must it be sold per Pound to gain 6*l.* 3*l.* per Cent. and what will be the total Gain?

Ans. The selling Price 6*s.* 8*d.* per Pound and the total Gain 10*l.* 15*s.* 10*d.*

4. A Linen-draper sold Cotton at 4*s.* 8*d.* per Yard, and thereby gained 16*l.* 3*l.* per Cent. what had the Cotton cost him per Yard? *Ans.* 4*s.*

5. A Tea Merchant mixed a Quantity of Tea, standing him in 4*s.* 2*d.* per Pound, with an equal Quantity of other Tea at 5*s.* 4*d.* per Pound, how must he sell the Mixture per Pound, to gain 30*l.* per Cent.?

Ans. 6*s.* 2-10*d.*

6. If Wine be sold at 12*s.* per Gallon, and thereby 12*l.* per Cent. gained, what was it bought for?

As 112.5*l.* : 100 : : 12*s.* : 10*s.* 8*d.* the *Ans.*

L

7. Silk

7. Silk being sold at 18*s.* per Yard, and thereby 20*l.* per Cent. gained, how much was given for it.

Ans. 15*s.*

8. If by selling Muslin at 5*s.* 8*d.* per Yard, the Gain per Cent. be 6*l.* 5*s.* how much would it be, if the Muslin was sold for 6*s.* 4*d.* per Yard?

As 5*s.* 8*d.* : 6*s.* 4*d.* :: 106*l.* 5*s.* : 118*l.* 15*s.* then
118*l.* 15*s.* - 100*l.* = 18*l.* 15*s.*

9. A Grocer sold Sugar at 9*d.* per Pound, and gained 12½*l.* per Cent. what would his Gain have been per Cent. if he had sold it for 1½*d.* more per Pound?

Ans. 31*l.* 5*s.*

10. Bought 288 Yards of Sattin at 8*s.* per Yard, the Charges being 14*l.* 8*s.* how must 1 Yard be sold to gain 18*l.* per Cent. and what will be the total Gain.

Ans. 10*s.* 7½*d.* and the whole Gain 23*l.* 6*s.* 6¼*d.*

11. Cotton being bought at 2*s.* 8*d.* per Yard, and proving to be of a worse Quality than the Purchaser expected it to be, he is willing to lose 10*l.* per Cent. how must he sell it?

As 100*l.* : 90*l.* :: 2*s.* 8*d.* : 2*s.* 4½*d.* per Yard.

12. Two Horses were bought for equal Prices. One of them was sold for 60*l.* and 20*l.* per Cent. gained by him; but the other was sold so, that 20*l.* per Cent. was lost by him; how much was the latter sold for, and what was the prime Cost of each?

Ans. The latter was sold for 40*l.* and each cost 50*l.*

E X C H A N G E.

EXCHANGE is the receiving Money in one Country, for the Value of it, in another Country. The Par of Exchange is when the Money received in one Country is of the same real Value, as the Money delivered in another.

The

The Course of Exchange is the Rate at which Bills are bought, and varies daily, according to the Demand for them. It is seldom equal to Par.

TABLES of FOREIGN COINS, &c.

I. H O L L A N D.

16 Penings	=	1 Stiver.
6 Stivers	=	1 Flemish Shilling.
20 Stivers	=	1 Guilder.
6 Guilders	=	1 Flemish Pound.

Accounts are kept in Flemish Pounds, Shillings, and Pence. The Par is 35*s.* 6 $\frac{2}{3}$ *d.* Flemish for 1 Pound Sterling.

II. F R A N C E.

12 Deniers	=	1 Sol.
20 Sols	=	1 Livre.
3 Livres	=	1 Exchange Crown.

French Accounts are kept in Livres, Sols, and Deniers. The Par is 1 French Crown for 2*s.* 7 $\frac{1}{4}$ *d.*

III. S P A I N.

34 Maravedies	=	1 Rial
8 Rials	=	1 Piece of Eight.
10 Rials	=	1 Dollar.
36 Rials	=	1 Pistole.

L 2

Ac-

Accounts are kept in Dollars, Rials, and Maravedies.
The Par is 1 Piece of Eight = 3s. 7d.

IV. P O R T U G A L.

1000 Reas = 1 Milrea.

Accounts in Milreas and Reas. Par 1 Milrea = 5s. 7½d.

V. I T A L Y.

12 Deniers = 1 Sol.

20 Sols = 1 Livre

5 Livres = 1 Piece of Eight at Genoa.

6 Livres = 1 Piece of Eight at Leghorn.

Accounts in Livres, Sols, and Deniers. Par 4s. 6d. for a Dollar.

RULE. Use either Practice, Proportion, or Division, as the Example requires.

E X A M P L E S.

1. How many Flemish Pounds are equal to 720*l*, Sterling, the Course of Exchange being 34s. 10d. for 1*l*. Sterling?

1 <i>l</i> . Flemish		720
10s. - -	2	360
4s. - -	5	144
10d. - -	12	30

1254 Flemish Pounds.

2. Paid

2. Paid 1000*l.* Sterling for a Bill on Amsterdam, how much Flemish is that, Exchange being 35*s.* 5½*d.* Flemish for 1*l.* Sterling?

Ans. 1772*l.* 18*s.* 4*d.*

3. A Merchant at Amsterdam remits to London 1200 Guilders, 12 Stivers, how much Sterling does it amount to, Exchange being 34*s.* 6*d.* Flemish for 1*l.* Sterling.

Ans. 116*l.*

4. How many Guilders may I have for 118*l.* 15*s.* 6*d.* Sterling, Exchange at 35*s.* 4*d.* Flemish per Pound, Sterling?

Ans. 125*guil.* 8*stiv.* 4½*pen.*

5. How much Bank Money can I have for 1865 Guilders, Current Money, the Agio or Difference being 4 Guilders per Cent.?

gu. cur. gu. bank. gu. cur. gu. b. sti. pen.

As 104. : 100 :: 1865 : 1793 5 6½.

6. What Quantity of Flemish Currency must I have for 285*l.* 11*s.* 6*d.* Sterling, Exchange at 33*s.* 10*d.* Flemish Bank per Pound Sterling, and Agio 4½*d.* per Cent.

Ans. 504*l.* 16*s.* 8½*d.*

7. Paris remits to London 9620 Livres 12 Sols 4 Deniers at 30½*d.* per Crown, how much Sterling does it come to

Ans. 405*l.* 17*s.* 4½*d.*

8. A Person in London received 1000*l.* for a Bill on a Merchant in Lisbon, how many Milreas was it for, Exchange being 5*s.* 4*d.* per Milrea?

Ans. 3750 Milreas.

9. Paid in London 500*l.* for a Bill on Dublin, Exchange at 110 per Cent. how much was the Bill for?

Ans. 550*l.* Irish.

10. A Merchant at Jamaica remits 417*l.* 10*s.* 6*d.* Currency, how much Sterling must be received for it, Exchange at 145*l.* per Cent.?

Ans. 287*l.* 18*s.* 11½*d.*

L 3 10. If

10. If Bills at London on Amsterdam be $34s. 3\frac{1}{4}d.$ Flemish per Pound Sterling, and on Paris at $32\frac{1}{2}d.$ per Crown; what ought to be the Rate of Exchange between Paris and Amsterdam? *Ans.* $59\frac{2}{10}d.$

11. If 14 Pounds of Sugar be exchanged for 34 Pounds of Raisins, and 50 Pounds of Raisins for $8\frac{1}{4}$ Pounds of Almonds at $20d.$ per Pound, what is the Price of the Sugar per Pound?

P E R M U T A T I O N.

PERMUTATION shews how often the Situation of Things may be varied; thus, a, b, c, may be placed in six different Situations, viz. abc, acb, bac, bca, cab, and cba.

RULE. Multiply the Numbers all into one Product.

E X A M P L E S.

1. In how many different Positions can 9 Persons be placed?

Ans. $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9 = 362880.$

2. How many Changes may be rung on 11 Bells?

Ans. 39916800.

ARITHMETICAL PROGRESSION.

WHEN any Series or Rank of Numbers increase, or decrease regularly, they are in Arithmetic Progression, as 3, 5, 7, 9, 11, 13, 15, &c. And 29, 25, 21, 17, 13, &c.

The

The several Parts of a Series are.

The least Term.

Common Difference.

Number of Terms.

Greatest Term.

Sum of the Series.

Any three of these being given, the other two readily may be found. This admits of twenty Cases. The two most useful ones only, are considered in this Treatise.

C A S E I.

The least Term, Common Difference, and Number of Terms, to find the greatest Term.

RULE. Multiply the Number of Terms, less 1, by the common Difference, and add the least Term.

E X A M P L E S.

1. The least Term of a Series in Arithmetic Progression being 10; the common Increase 3, and Number of Terms 22, required the greatest Term.

Ans. 73.

2. The Master of an Academy began with seven Scholars, and upon an Average, 3 entered every Week, for 25 Weeks, how many Scholars had he then?

Ans. 79.

3. A Gentleman travelled 9 Days. The first Day 24 Miles, and increased 2 Miles every Day, how many Miles did his last Day's Journey consist of?

Ans. 160.

C A S E

C A S E II.

Given as before the least Term, common Difference, and Number of Terms to find the Sum of the Series.

RULE. Multiply the Number of Terms less 1, by the common Increase, add twice the least Term, and multiply the Sum by the Number of Terms.

E X A M P L E S.

1. A Debt can be discharged in a Year, by paying 8*d.* the first Week; 18*d.* the second, and thus continuing always 10*d.* more each Week, what is the Debt?

$$\frac{51 \times 10 + 8 \times 2}{2} \times 52 = 13676d = 56l. 19s. 8d.$$

2. If 150 Stones were placed 2 Yards from each other, and the first 2 Yards from a Basket, how far must the Person go to bring them one by one into the Basket?

The least Term is 4, and greatest 300, when these are known, the Sum of the Series is found by multiplying half their Sum by the Number of Terms.

$$\frac{4 + 300}{2} \times 150 = 15300yds = 8mil. 1220yds.$$

3. How often does a Clock strike in 24 Hours?

Ans. 156.

If these two Cases be well understood, there will be no Difficulty in performing any of the other.

GEOME-

GEOMETRICAL PROGRESSION.

ANY Series of Numbers, increasing by a common Multiplier, or decreasing by a common Divisor, are in Geometrical Progression. The common Multiplier or Divisor, is called the Ratio.

C A S E I.

The least Term, Ratio, and Number of Terms given to find the greatest Term.

RULE. Multiply the Ratio, as often by itself, except once, as there are Number of Terms, and multiply the Product by the least Term.

E X A M P L E S.

1. The least Term of a Series in Geometrical Progression, being 10, the Ratio 2, and Number of Terms 13, what is the greatest, or thirteenth Term?

When 2 the Ratio is multiplied 12 Times by itself, the Product is 4096, which multiplied by 10, the least Term, the greatest Term is found 40960.

2. A Servant agreed with a Farmer to serve 12 Years, and to have nothing for his Service but the Produce of a Wheat Corn for the first Year, and that Produce to be sowed for the second Year, and so on from Year to Year, until the End of the said Time. Required the Worth

Worth of the last Year's Produce, if the Increase be every Year tenfold; that 49152 Wheat Corns make a Bushel, and that the Whole is sold at 6s. per Bushel?

Ans. 678168l. 6s.

C A S E II.

The least Term, Ratio, and Number of Terms given as before to find the Sum of the Series.

RULE. Find the greatest Term by Case I. then multiply the greatest Term by the Ratio; subtract the least Term, and divide by the Ratio less 1.

E X A M P L E S.

1. The least Term of a Geometrical Series being 6, the Ratio 3, and Number of Terms 13, what is the Sum of the Series?

$$3 \times 3 \times 3 \times 3 = 81 = \text{Ratio, four Times multiplied.}$$

$$81 \times 81 \times 81 = 531441 = \text{Ratio, 12 Times multiplied.}$$

$$531441 \times 6 = 3188646 \text{ Greatest Term.}$$

$$3188646 \times 3, - 6$$

$$\hline = 4782966 \text{ Sum Series.}$$

2

2. What Debt will be discharged in 12 Months, by paying 5s. the first Month, 10s. the second, 20s. the third, &c.?

Ans. 1023l. 15s.

3. Two young Gentleman, A and B, speaking of the intended Marriage of the former, A said, give me 10,000l. and I will give you Two-pence to Day, Six-pence Tomorrow, Eighteen-pence the third Day, and increase in that Manner every Day until I am married.

B agreed

B agreed, and in 20 Days A married. Which of them had the advantage? *Ans.* B 14518268/ 6s. 8d.

4. A Man bought a Horse, and by Agreement was to give, a Farthing for the first Nail, two for the Second, four for the Third, &c. There were four Shoes, and 8 Nails in each Shoe. Required the Price of the Horse?

Ans. 4473924/ 5s. 3½d.

C A S E III.

The greatest Term, in a descending or decreasing Series, the Divisor, and Number of Terms to find the least Term.

RULE. Multiply the Divisor as often by itself, except once, as there are Terms, and thereby divide the greatest Term.

E X A M P L E S.

1. The greatest Term of a descending Series in Geometrical Progression being 6144, the common Divisor 2, and Number of Terms 12. Required the least Term? *Ans.* 3.

2. A Person laid up a certain Sum on the first of January; twice as much on the first of February; four Times as much on the first of March, and so on doubling every Month. The Sum laid up on the first of December was 17/ 1s. 4d. What did he begin with, and what did he save in all?

Ans. It was 2d. he began with, and his whole Year's saving amounted to 34/ 2s. 6d.

The Use of the TABLE.

Opposite to any given Month, and under the Dominical Letter for the Year, there is the Day of the Week, on which that Month begins. Which being known, it is easy to find the Day of the Week on which any other Day of that Month falls. Observe that the 1st, 8th, 15th, 22d, and 29th Days of a Month, are all on the same Day of the Week.

E X A M P L E S.

1. On what Day of the Week will November begin in the Year 1787? Opposite to November, and under G, is Thursday, which is the 1st of November.

2. On what Day of the Week will April begin in 1788. *Ans.* Tuesday.

3. On what Day of the Week will his Majesty's Birth Day be in 1788?

Against June, and under E is Sunday, for the 1st of June, and therefore the 4th will be Wednesday.

4. On what Day of the Week will Christmas Day fall in 1790? *Ans.* Wednesday.

5. What Day of the Month will the first Monday after Michaelmas, 1787, be on? *Ans.* October 1st.

The *Cycle of the Sun* which is a Period of 28 Years, comprehending all the Varieties of the Dominical Letters, is found by adding 9 to the Year, and dividing by 28, the Remainder being the Solar Cycle.

V. To find the Moon's Age, or Number of Days since the Change.

RULE.

RULE. Add the Epact, the Day of the Month, and Number belonging to the Month. The Sum is the Age. But if the Sum is above 29 in a Month which has 30 Days, subtract 29; and if above 30 in a Month which has 31 Days, subtract 30.

The Numbers for the Months are,

January, February, March, April, May, June,

0 2 1 2 3 4

July, August, Sept. October, November, December.

5 6 7 8 9 10

E X A M P L E S.

1. Required the Moon's Age on December 5th, 1787.

Epact	-	-	-	-	=	11
Day Month	-	-	-	-	=	5
Number for December	-	-	-	-	=	10

Moon's Age. - - - 26

2. Required the Moon's Age on January 12th, 1788.

Ans. 4 Days.

3. Required the Moon's Age on October 16th, 1790?

Ans. 8 Days.

VI. To find the Time of the Moon's Southing nearly.

RULE. Multiply the Moon's Age by 4, and divide by 5, the Quotient is the Hours, and twelve Times the Remainder is the Minutes, Afternoon. If above 12 Hours, subtract 12, the Remainder is the following Morning.

E X-

E X A M P L E S.

1. Required the Time of the Moon's Southing on October 17th, 1787.

Moon's Age 6

4

5)24

4h. 48m. afternoon

2. Required the Moon's Southing on January 14th, 1788? *Ans.* 8h. afternoon.

VII. To find the Time of High water at any given Place.

RULE. To the Moon's Southing, add the Time in the following Tide Table.

				<i>b. m.</i>
Aberdeen, Scotland	—	—	—	0 45
Alborough, England	—	—	—	9 45
Amsterdam, Holland	—	—	—	3 0
Antwerp, Flanders	—	—	—	6 0
Baltimore, Ireland	—	—	—	4 30
Bayonne, France	—	—	—	3 30
Belfast, Ireland	—	—	—	10 0
Bremen, Germany	—	—	—	6 0
Bristol, England	—	—	—	6 45
Cadiz, Spain	—	—	—	4 30
Charles Town, America	—	—	—	3 0
Dover, England	—	—	—	11 15

Dun-

	<i>b.</i>	<i>m.</i>
Dunkirk, France — — —	0	0
Edinburgh, Scotland — — —	4	30
Good Hope, Cape — — —	3	0
Hull, England — — —	6	0
Lisbon, Portugal — — —	2	15
London — — —	3	0
Portsmouth, England — — —	11	15
Senegal R. Africa — — —	10	30
Southampton, England — — —	0	0
Teneriff I. Atlantic Ocean — — —	3	0
Yarmouth, England — — —	9	45

A N E X A M P L E.

Required the Time of High Water at London, and at Bristol, on October 20th, 1787.

	<i>b.</i>	<i>m.</i>		<i>b.</i>	<i>m.</i>
Moon's Southing	7	12	Moon's Southing	7	12
London — —	3	0	Bristol — — —	6	45
Afternoon —	10	12	Next morning	1	57

VIII. Find on what Day after March 20th, the Moon is 15 Days old, that is Full*.

The Sunday next after that Day is Easter-Sunday. Shrove-Sunday is 49 Days before Easter, and Whit-Sunday is 49 Days after Easter?

* These are called Paschal Full Moons.

E X-

E X A M P L E S.

1. Required Easter-Day in 1788.

Epact	22	From	-	43
March	20	Take	-	30
Number	1			—
	—	Moon's Age		13
	43			—

Therefore it will be full Moon on March 22, which falls on a Saturday, See page 164, and consequently Easter-Day falls on March 23d.

Forty-nine Days before March 23d in a Leap Year, gives February 3d for Shrove-Sunday, and therefore Ash-Wednesday, or the first Day of Lent is on February 6th.

Forty-nine Days after March 23d, is May 11th, which is Whit-Sunday?

2. Required Shrove-Sunday, Easter-Day, and Whit-Sunday, in 1790?

Ans. Feb. 14th, April 4th, and May 23d.

A
GEOGRAPHICAL TABLE,

SHEWING THE

DIRECT DISTANCE IN ENGLISH MILES,

AND BEARING FROM LONDON,

OF THE

PRINCIPAL PLACES on the EARTH;

And the Probable Time of Sailing to them from London.

E. stands for Europe; A for Asia; Af. Africa;
N. A. North America; and S. A. South America.

Places which have a Line — through the last Column
are Inland Places.

Distance and Bearing from London, &c.

	Distance in English Miles.	Bearing.	Time of Sailing in Days.
A			
Aberdeen, Scotland, E.	411	N.	7
Abo, Sweden, E.	1028	N.E.bE.	16
Acapulco, Pacific Ocean, S. A.	6220	W.S.W.	164
Alexandria, Egypt, A.	2129	S.E.	42
Algiers, Barbary, Af.	1045	S.bE.	24
Alicant, Spain, E.	880	S.	24
Amazon river, * Atlantic Ocean, S. A.	4622	S.W.bW.	50
Amsterdam * Holland, E.	218	E.bN.	3
Antigua, * L. W. Indies	4140	S.W.bW.	45
Ascension, I. Atlantic Ocean, Af.	1045	S.bW.	50
Astracan, Siberia, A.	2430	E.bS.	—
B			
Bagdat, Turkey, A.	2530	S.E.bE.	—
Barbadoes, * I. W. Indies	4300	S.W.bS.	48
Barcelona, Spain, E.	703	S.bE.	28
Bencoolen, Sumatra, I. East Indies	4262	S.E.bE.	144
Bergen, * Norway, E.	629	N.N.E.	8
Berlin, Prussia, E.	572	E.	—
Bermuda, * I. Atlantic Ocean, N. A.	3535	W.S.W.	40
Bern, Switzerland, E.	454	S.E.	—

Course is Direct to all the Places marked thus *.

Distance and Bearing from London, &c.

	Distance in English Miles.	Bearing.	Time of Sailing in Days.
Berwick, England, E.	304	N.bW.	6
Bilboa, * Bay of Biscay, Spain	507	S.bE.	7
Bremen, Germany, E.	382	E.N.E.	5
Brest, France, E.	286	S.W.	6
Bristol, England, E.	111	W.	8
Bombay, East Indies, A.	4590	S.E.bE.	140
Boston, * New England, N. A.	3390	W.bS.	38
Botany Bay, A.	11140	S.E.bE.	155
C			
Cadiz, Spain, E.	1111	S.S.W.	19
Calcutta, East Indies, A.	5100	S.E.bE.	134
Candia I. Mediterranean, E.	1356	S.E.	37
Canton, China, A.	6409	E.S.E.	170
Cape Bona, Barbary, A.	1104	S.S.E.	30
— Bonavista, * Newfound- land, N. A.	2200	W.	26
— Clear, Ireland, E.	423	W.	8
— Coromin, E. Indies	5352	S.E.bE.	136
— Finisterre, * Spain, E.	945	S.W.bS.	12
— Florida, * Florida, N. A.	4786	W.S.W.	54
— Good Hope, Af.	6068	S.bE.	80
— Horn, S. A.	8900	S.W.bS.	104
— Matapan, Mediterra- nean, E.	1527	S.E.	37
— May, Atlantic Ocean, N. A.	3670	W.bS.	42
	P 2		

Distance and Bearing from London, &c.

	Distance in English Miles.	Bearing.	Time of Sailing in Days.
Cape Nassau, * Terra Firma, S. A.	4591	S.W.	52
— Palmas, Guinea, Af.	3500	S.bW.	44
— St. Augustine, * S. A.	4678	S.S.W.	58
— St. Lucas, California, S.A.	6361	W.S.W.	170
— St. Sebastian, Mada- gascar, I. Af.	6037	S.E.bE.	101
— St. Vincent, Portugal, E.	1114	S.S.W.	15
— Southampton, Hud- son's Bay, N. A.	3422	W.bN.	45
— Verd, Negroland, Af.	2737	S.S.W.	30
— Victory, Pacific Ocean, S.A.	8753	S.W.	109
Charles Town, * South Ca- rolina, N. A.	4224	W.bS.	47
Cherry I. North Sea, E.	1690	N.N.E.	18
Cochin, East Indies, A.	5226	S.E.bE.	133
Cologne, Germany, E.	250	E.bS.	—
Columbo, Ceylon I. East In- dies	5460	S.E.bE.	138
Constantinople, Turkey, E.	1584	E.S.E.	47
Copenhagen, Denmark, E.	594	N.E.bN.	9
Cork, Ireland, E.	382	W.	8
Corfica I. Mediterranean Sea, E.	780	S.E.bS.	29
Cracow, Poland, E.	857	E.bS.	—
Cyprus I. Mediterranean Sea, E.	2000	S.E.bE.	35

Distance and Bearing from London, &c.

	Distance in English Miles.	Bearing.	Time of Sailing in Days.
D			
Dantzick, Poland, E.	776	E.bN.	13
Delly, East Indies, A.	2619	E.S.E.	—
Dierbeck, Turkey, A.	2278	E.S.E.	—
Dominica I. W. Indies	4210	S.W.bW.	47
Dresden, Germany, E.	568	E.	—
Dublin, Ireland, E.	332	W.N.W.	9
E			
Edinburgh, Scotland, E.	331	N.N.W.	7
F			
Falkland If. * S. A.	7980	S.S.W.	88
Ferro I. * Atlantic Ocean, Af.	1884	S.W.bS.	20
Flamborough Head, Eng- land, E.	161	N.	4
Formosa I. China, A.	6670	E.bS.	172
G			
Gambia River, Guinea, Af.	2757	S.S.W.	31
Genoa, Italy, E.	645	S.E.	32
Gibraltar, Spain, E.	1104	S.bW.	20
Glasgow, Scotland, E.	342	N.W.bN.	11
Gottenburgh, Sweden, E.	642	N.E.	9
Granada I. * West Indies	4405	S.W.bW.	49
Grand Cairo, Egypt, A.	2249	S.E.	45
Good Hope, C. Af.	6068	S.bE.	80

Distance and Bearing from London, &c.

	Distance in English Miles.	Bearing.	Time of Sailing in Days.
Guernsey I. British Chan- nel, E.	172	S.W.bS.	4
Gulf of Mexico, * Ame- rica	4786	W.S.W.	54
H			
Hamburgh, Germany, E.	463	E.N.E.	8
Hanover, Germany, E.	360	E.bN.	—
Havannah, * Cuba I. West Indies	4960	W.S.W.	56
Hispaniola I. * W. Indies	4341	S.W.bW.	49
Horn, Cape, S. A.	8900	S.W.bS.	104
I			
Iceland I. North Sea, E.	1024	N.N.W.	14
Isfahan, Persia, A.	2846	E.S.E.	—
J			
Jamaica I. * W. Indies	4765	S.W.bW.	53
Java I. Indian Ocean	7530	S.E.bS.	144
K			
Koningsburgh, Baltic, E.	900	E.bN.	13
L			
Leghorn, Italy, E.	780	S.E.	33
Lima, Peru, S. A.	6450	S.W.	141

Distance and Bearing from London, &c.

	Distance in English Miles.	Bearing.	Time of Sailing in Days.
Lisbon, Portugal, E.	1000	S.W.bS.	14
Liverpool, England, E.	180	N.W.	10
Lizard, England, E.	254	W.S.W.	6
M.			
Madeira I. *. Atlan. Ocean, Af.	2370	S.W.bS.	28
Madras, E. Indies, A.	5292	S.E.bE.	145
Madrid, Spain, E.	600	S.S.W.	—
Majorca I. Mediterranean Sea, E.	805	S.	26
Moldavia If. Indian Ocean, A.	5236	S.E.bE.	133
Malta I. Mediterranean Sea, E.	1300	S.E.bE.	39
Manila, Manila I. A.	7163	E.S.E.	167
Mecca, Arabia, A.	3025	S.E.	133
Medina, Arabia, A.	2832	S.E.	—
Mexico, S. A.	6093	W.S.W.	—
Milan, Italy, E.	603	S.E.	—
Minorca I. Mediterranean Sea, E.	725	S.bE.	27
Mocha, Arabia, A.	3619	S.E.	126
N			
Nankin, China, A.	6095	E.bS.	208
Naples, Italy, E.	1000	S.E.	34
Naze * of Norway, E.	513	N.E.bN.	7
Newcastle upon Tyne, Eng- land, E.	246	N.bW.	5

Distance and Bearing from London, &c.

	Distance in English Miles.	Bearing.	Time of Sailing in Days.
New-York, * N. A.	3590	W.bS.	40
Nile River A.	2173	S.E.	44
Nubia, Ethiopia, Af.	2915	S.E.bS.	—
P			
Panama, Pacific Ocean, S. A.	5592	S.W.bS.	156
Pekin, China, A.	5510	E.bS.	—
Petersburgh, Russia, E.	1310	E.N.E.	—
Plymouth, England, E.	218	E.S.E.	5
Point Look out, Greenland, E.	1820	N.N.E.	20
Pondicherry, E. Indies, A.	5267	S.E.bE.	146
Portsmouth, England, E.	76	S.W.	3
Prague, Bohemia, E.	642	E.bS.	—
Q			
Quebec, Canada, N. A.	3270	W.bS.	40
R			
Revel, Russia, E.	1080	E.N.E.	15
Rhodes I. Mediterranean Sea, E.	1673	S.E.bS.	30
Riga, Russia, E.	1050	E.N.E.	15
Rome, Italy, E.	857	S.E.bS.	33

Distance and Bearing from London, &c.

	Distance in English Miles.	Bearing.	Time of Sailing in Days.
S			
Sardinia I. Mediterranean Sea, E.	832	S.E.bS.	33
Scaw, Denmark, E.	602	N.E.	7
Shetland If. North Sea, E.	662	N.bW.	9
Siam, East Indies, A.	6540	E.S.E.	163
Sicily I. Mediterranean Sea, E.	1174	S.E.bS.	32
Smyrna, Turkey, A.	1625	S.E.bE.	41
Sound, entrance into the Baltic	600	N.E.bE.	8
Spitsbergen, Greenland, E.	2032	N.N.E.	24
Stockholm, Sweden, E.	865	N.E.bE.	14
Straits of Babelmandel, en- trance into Red Sea, A.	3707	S.E.	124
—— of Magellan, S. A.	8354	S.W.bS.	100
—— Sunda, between the Islands Sumatra and Ja- va, Indian Ocean, A.	7521	S.E.bS.	146
Surat, East Indies, A.	4600	S.E.bE.	138
T			
Teneriff I.*Atlantic Ocean, Af.	1910	S.W.bS.	23
Turin, Italy, E.	585	S.E.bS.	—
V			
Valencia, Spain, E.	855	S.	26

Distance and Bearing from London, &c.

	Distance in English Miles.	Bearing.	Time of Sailing in Days.
Venice, Italy, E.	742	S.E.bE.	40
Vienna, Germany, E.	726	E.S.E.	—
W			
Warsaw, Poland, E.	877	E.	—
Whitby, England, E.	208	N.bW.	4
Whitehaven, England, E.	242	N.W.	12

The Time in Days multiplied by 80, gives the Nautical or Geographical Miles in the tract of Sailing, thus $145 \times 80 = 11600$, is the Geographical Miles in the Tract of Sailing from London to Madras.

A
N U M B E R
O F
O R I G I N A L Q U E S T I O N S
A S
O C C A S I O N A L E X E R C I S E S.

1. **A** GENTLEMAN paid for an Estate twenty Thousand and eight Pounds. For a House, four Thousand and twenty Pounds, eleven Shillings and four-pence; and for Furniture, three Thousand two Hundred Pounds seven Shillings and Eight-pence; how much did he pay in the Whole?

Ans. 27228*l.* 19*s.* 2*d.*

2. The Neptune having on Board 13 Ton 12 Hundred Weight 3 Quarters 14 Pounds of Sugar. The Resolution 80 Tons 11 Hundred Weight. The Trident 56 Tons 10 Hundred Weight 3 Quarters 14 Pounds; and the Briton, one Hundred and seven Tons, and fourteen Pounds; how much Sugar was on Board these four Ships?

Ans. 257*t.* 14*cwt.* 3*qr.* 14*lb.*

3. A Wine-

3. A Wine-Merchant has 31 Hogsheads 41 Gallons 3 Pints of Claret; 17 Hogsheads 15 Gallons 3 Pints of Port; 40 Hogsheads 1 Pint of Burgundy; 16 Hogsheads of Maderia; and 104 Hogsheads 61 Gallons of other Kinds; required the Stock?

Ans. 220hhd. 59g. 7pts.

4. One Army contained seventy Thousand and two Hundred Men; in another there were sixty-four Thousand three Hundred and fifty-nine; how many did the Former exceed the Latter?

Ans. 5841.

5. At an Election which lasted three Days, the Numbers were as under.

	For Mr. Nemo.	For Mr. Dave.
1 Day - - - -	215	202
2 Day - - - -	249	261
3 Day - - - -	164	158
Required the Majority?	<i>Ans.</i> 7 for Mr. Nemo.	

6. Subtract $9\frac{1}{2}d.$ from one Thousand Pounds and Eight-pence?

Ans. 999l. 19s. $10\frac{1}{2}d.$

7. Required the Product of 53034000 by 400600?

Ans. 21245420400000.

8. A Gentleman went out with ten Guineas; he received from A 132 Pounds 10 Shillings and Six-pence; from B 40 Pounds, and from H 90 Pounds and Four-pence. He paid for $26\frac{1}{2}$ Gallons of Brandy at 9 Shillings and Nine-pence per Gallon; for Timber he paid 40 Pounds 10 Shillings and Sixpence, and his Expences were 1 Pound 5 Shillings and Two-pence; how much Money did he return with?

Ans. 218l. 6s. $9\frac{1}{2}d.$

9. Divide 6948 Pound among four Officers, A, B, C, D, and 60 Men; give A as much as 14 Men; B as much as 10 Men; C as much as 8 Men; and D as much

much as 4 Men; required the Share of each Officer and Man?

Ans. A 1013*l.* 5*s.* B 723*l.* 15*s.* C 579*l.* D 289*l.*
10*s.* and each Man 72*l.* 7*s.* 6*d.*

10. When two-eighths of a Prize of Sixty Thousand Pounds belong to 720 Men; how much is the Share of each?

Ans. 20*l.* 16*s.* 8*d.*

11. Three Brothers A, B, and C receive 35 Pounds amongst them from their Father, who observes that if A spends 7 Shillings and Sixpence per day; B 5 Shillings and Sixpence; and C 4 Shillings and Sixpence, they will all be without Money on the same Day; how much did each receive, and in how many Days will the Money be all spent?

Ans. A 15*l.* B 11*l.* C 9*l.* and 40 Days.

12. How many Pounds are in three Hundred and fifty-two Thousand two Hundred and ninety-four Farthings?

Ans. 366*l.* 19*s.* 5½*d.*

13. Reduce $\frac{224}{332}$ into its least Terms.

Ans. $\frac{11}{17}$.

14. What is the Proportion or Ratio between 96 and 32; Also what is the Ratio between 63 and 42; and between 456 and 428?

Ans. 3 to 1; 3...2. and 144...107.

15. Required the Sum of $90\frac{2}{7}$, $41\frac{7}{11}$, and $3\frac{6}{7}$!

Ans. $135\frac{191}{154}$.

16. Subtract $12\frac{1}{2}$ from $20\frac{1}{2}$?

Ans. $7\frac{1}{2}$.

17. Multiply $6\frac{4}{5}$, $9\frac{2}{3}$, $1\frac{7}{8}$ and $2\frac{1}{2}$ into one Product.

Ans. $338\frac{11}{16}$.

18. Divide $\frac{2}{3}$ of $72\frac{1}{2}$ by $\frac{4}{5}$ of $9\frac{1}{2}$.

Ans. $6\frac{1}{2}$.

19. Add 132.75*l.* 64*l.* 17*s.* 6*d.* 41.875*l.* and 99½ into one Sum.

Ans. 330*l.* 12*s.* 6*d.*

20. Subtract 41.75 from 52.

Ans. 10.25.

21. Required the Product of .22585 by $\frac{2}{3}$?

Ans. .090340.

22. Divide 13.575 by 8.2432.

Ans. 1.64 +

23. How

23. How much do 9 Hundred 2 Quarters 17 Pounds of Sugar come to at Seven-pence per Pound?

Ans. 31*l.* 10*s.* 7*d.*

24. Bought 7 Hundred 2 Quarters 15 Pounds Weight of Goods at 1*l.* 12*s.* 8*d.* per Hundred Weight. Sold two-fifths of it at 2*l.* 2*s.* per Hundred Weight; four-ninths of them at 11*s.* 8*d.* per Quarter, and the Remainder at 4*d.* per Pound; required the whole Gain, and Gain per Cent.?

Ans. Whole Gain 4*l.* 1*s.* 6½*d.* Gain per Cent. 32*l.* 13*s.* 11½*d.*

25. A bought 624 Yards of Muslin at 7*s.* per Yard. He sold 200 Yards at 8*s.* 4*d.* 180 Yards at 9*s.* and the Remainder so, that he gained in all, the same as if he had sold all his Muslin at 8*s.* 3*d.* per Yard; how did he sell his last Parcel?

Ans. 7*s.* 7¾*d.* per Yard?

26. A Grocer bought 600 Pounds of Sugar at 8*d.* per Pound. He sold 120 Pounds at 10*d.* but the Price falling, he wishes to sell the Remainder so as to gain 10*l.* per Cent. by the 600 Pounds of Sugar; how must he sell the Remainder?

Ans. 8½*d.* per Pound.

27. In what Time will a Sum of Money lent at 4 per Cent. Simple Interest, gain three-fifths of the Principal?

Ans. In 15 Years.

28. How often will a Coach-wheel move round in travelling from London to Newcastle, which is 272 Miles, the Circumference of the Wheel being 18 Feet?

Ans. 79786¾.

29. A whimsical Gentleman has a Cistern with 6 Cocks; A can fill the Cistern in 6 Hours, B in 8, and C in 10; D can empty it when full in 4 Hours, E in 12, and F in 20. If the Cistern be empty, and all the Cocks be set open, in what Time will it be full?

Ans. In 120 Hours.

30. A Gentleman being asked his Age, said that if two-thirds of 2016 be added to 18 Times the Square of his

his Age, the Sum will be two-thirds of the Cube of 24; how old is he? *Ans.* 22 Years.

31. Bought 7 Pieces of Holland, each containing 30 Ells Flemish at 2s. per Ell, and sold it 3s. 6d. per Yard; required the whole Gain, and Gain per Cent.?

Ans. 6l. 6s. and 30l. per Cent.

32. Divide 282l. amongst A, B, and C, so that B may have three-fourths of A's, and C 4l. 10s. more than three-fourths of B's.

Ans. A 120l. B 90l. and C 72l.

33. If I can buy $\frac{3}{16}$ of a Ship for 150, what Share can I have for 240l.?

Ans. $\frac{1}{16}$, which is $\frac{4}{16} + \frac{1}{16}$.

34. Whether is $\frac{2}{7}$ of 100, or $\frac{3}{11}$ of 120, the greater?

Ans. The Difference is $\frac{80}{91}$ in favor of the former.

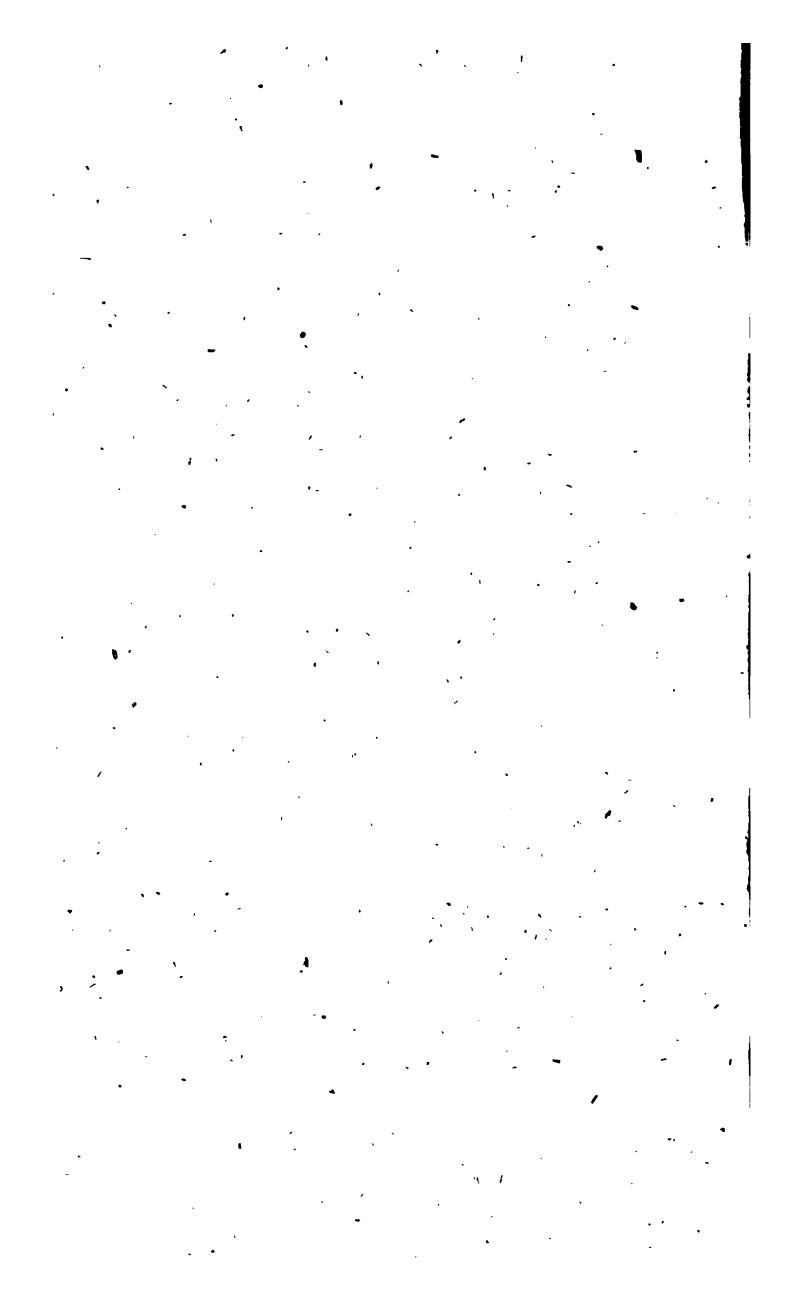
35. Concerning the two Numbers 48 and 36, answer these Queries; what is their Sum; their Difference; their Product; their Quotient; the Sum of their Squares; the Difference between their Squares; the Square Root of the Sum of their Squares, and the Cube Root of their Product?

The Answers are respectively 84, 12, 1728, $1\frac{1}{3}$, 2304, 1008, 60, and 12.

36. If two Men set out together the same Way, one to go every Day 20 Miles, the other 12 Miles the first Day, 14 the next, and so on increasing 2 Miles every Day. In how many Days from their setting out together, will they be together again?

Ans. 9 Days, each having travelled 180 Miles.

F I N I S.



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AUTHOR of the LONDON GENTLEMAN'S and SCHOOL-
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P R E F A C E.

9-12-35 MAR 5
THE reader or student of any work, especially of science, must in some degree, co-operate with the author ; otherwise every effort to serve him will be ineffectual. In the present case he must chearfully make himself thoroughly master of the three tables. For the labour and time employed for that purpose, he will be most amply rewarded. It is by a fa-

vi P R E F A C E.

miliar acquaintance with these tables, that the rules are performed, which are contained in this treatise.

There has never been any attempt of this kind made before. The reason probably is, that it has been thought impracticable. I have, however, long entertained an opinion of a very different kind ; being convinced, that such acuteness and expedition is attainable in accounts, that almost every computation, relative to the value of any quantity of goods, may be instantly performed without a pen, or any substitute for it. This is the idea on which this treatise is offered to the public ; and it is hoped that even a
transient

P R E F A C E.

transient reading of it will justify the idea.

The enlarged multiplication table will be got off, by those who are advanced in arithmetic, in less time than they formerly employed on the common one. The same may be said of the pence table. When they are once properly fixed, they will no more escape the memory than the common ones.

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to be capable of instantly dividing two or three figures, as 78, 216, 265, by any small divisor, especially 2 or 4. This may easily be attained by a little practice.

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To youth, who have already entered into a commercial line, this book is also respectfully offered.

The

The great advantage of this expeditious mode of computation, and the uncommon satisfaction which conciseness in accounts gives to the mind, will, I humbly venture to hope, make it, when known, generally adopted and encouraged.

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BY

THE AUTHOR AND ASSISTANTS.

CON:

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CHA-

CHARACTERS used in this Book.

\equiv Equal.

$+$ Add, thus, $6l. 12l. + 9s. 5d. = 7l. 1s. 5d.$

$-$ Subtract, as $8l. 1s. - 17s. 8d. = 7l. 3s. 4d.$

\times Multiply, thus, $4l. 2s. 7d. \times 3 = 12l. 7s. 9d.$

\div Divide, as $8l. 7s. 3d. \div 2 = 4l. 3s. 7\frac{1}{2}d.$

$3..15::8..40$, signifies, as 3 is to 15, so is 8 to 40.

One number is said to be a multiple of another, when the former can be divided by the latter, without a remainder: thus 24 is a multiple of 6, for 24 can be divided by 6 without a remainder.

Again, 156 is a multiple of 12; for it can be divided by 12, and there is no remainder.

T H E MENTAL ACCOUNTANT.

S E C T I O N I.

The necessary Tables, and their Explanation.

T A B L E I.

AN ENLARGED MULTIPLICATION.

1	13	14	15	16	17	18	19
2	26	28	30	32	34	36	38
3	39	42	45	48	51	54	57
4	52	56	60	64	68	72	76
5	65	70	75	80	85	90	95
6	78	84	90	96	102	108	114
7	91	98	105	112	119	126	133
8	104	112	120	128	136	144	152
9	117	126	135	144	153	162	171
10	130	140	150	160	170	180	190
11	143	154	165	176	187	198	209
12	156	168	180	192	204	216	228

B T A B L E

T A B L E II.

AN ENLARGED PENCE TABLE.

D.	S. D.	D.	L. S. D.
150	12 6	228	0 19 0
156	13 0	230	0 19 2
160	13 4	240	1 0 0
168	14 0	252	1 1 0
170	14 2	300	1 5 0
180	15 0	400	1 13 4
190	15 10	500	2 1 8
192	16 0	600	2 10 0
200	16 8	700	2 18 4
204	17 0	800	3 6 8
210	17 6	900	3 15 0
216	18 0	960	4 0 0
220	18 4	1000	4 3 4

T A B L E

T A B L E III.

ALIUQUOT PARTS OF A GUINEA.

S. D.	Parts.	S. D.	Parts.
10 6	2	2 4	9
7 0	3	1 9	12
5 3	4	1 6	14
3 6	6	1 3 $\frac{3}{4}$	16
3 0	7	1 2	18
2 7 $\frac{3}{4}$	8	0 10 $\frac{1}{2}$	24

The enlarged Multiplication Table.

This table is to be got off in the same manner as the common one, which is inserted in most books of arithmetic.

For instance, 7 times 16. In a direct line with 7, and under 16 is 112.

The enlarged Pence Table.

It will be easy enough, by a little practice, to express instantly the value of any intermediate number to those in the table, as well as those actually inserted in it; at least, as high as one pound.

For instance, as 160*d.* is 13*s.* 4*d.* it will immediately occur that 162*d.* is 13*s.* 6*d.*

Again, as 228*d.* is 19*s.* it is instantly known that 227*d.* is 18*s.* 11*d.*

Aliquot Parts of a Guinea.

This table is to be read in the same manner as the table of the aliquot parts of a pound in common practice. Thus 10*s.* 6*d.* is contained twice in a guinea; 2*s.* 4*d.* is nine times in a guinea, &c.

Besides

Besides a most ready and perfect knowledge of these tables, off the book, the student must be very expert at dividing two or three figures, by any number under 20. *MENTAL ACCOUNTANT*

Half-pence are reduced into pence, by dividing by 2; farthings into pence, by dividing by 4. Hence, by an easy mental division, the value of any number of half-pence, or any number of farthings.

Thus 220 half-pence is $110d. = 9s. 2d.$

And 272 farthings $= 68d. = 5s. 8d.$



SECTION II.

*When the Quantity is any Number under 21,
and the Price any Number of Pence under
11;*

*Or when the Quantity is any Number under 11,
and the Price any Number under 21.*

R U L E.

BY knowing the enlarged table, the product of the quantity and price is instantly known; and, by the pence table, the shillings in that product are also instantly known.

EXAMPLE 1.

Required the value of 14 yards at 10*d.* per yard?

One who has the tables perfectly off will instantly know that $14 \times 10 = 140d.$ and that $140d. = 11s. 8d.$

EXAMPLE 2.

Required the value of 15 yards at 8*d.* per yard?—It is instantly known that $15 \times 8d. = 120d. = 10s.$

EXAMPLE 3.

Required the value of 19 yards at 8*d.* per yard?—Although 152*d.* which is instantly known to be the product of 19×8 , is not in the pence table; yet one who knows that 150*d.* is 12*s.* 6*d.* will immediately say that 152*d.* is 12*s.* 8*d.*

MORE

MORE EXAMPLES.

d. d. s. d.
 13 yards at $4 = 52 = 4 \quad 4.$

13 yards at $9 = 117 = 9 \quad 9.$

14 yards at $3 = 42 = 3 \quad 6.$

14 yards at $8 = 112 = 9 \quad 4.$

15 yards at $2 = 30 = 2 \quad 6.$

15 yards at $9 = 135 = 11 \quad 3.$

16 yards at $4 = 64 = 5 \quad 4.$

16 yards at $9 = 144 = 12 \quad 0.$

17 yards at $7 = 119 = 9 \quad 11.$

18 yards at $8 = 144 = 12 \quad 0.$

4 yards

$\begin{array}{cccc} d. & d. & s. & d. \\ 19 \text{ yards at } 5 = 95 = 7 & 11. \end{array}$

$4 \text{ yards at } 17 = 68 = 5 \quad 8.$

$4 \text{ yards at } 19 = 76 = 6 \quad 4.$

$5 \text{ yards at } 16 = 80 = 6 \quad 8.$

$5 \text{ yards at } 17 = 85 = 7 \quad 1.$

$7 \text{ yards at } 18 = 126 = 10 \quad 6.$

$7 \text{ yards at } 19 = 133 = 11 \quad 1.$

$8 \text{ yards at } 17 = 136 = 11 \quad 4.$

$8 \text{ yards at } 20 = 160 = 13 \quad 4.$

$9 \text{ yards at } 14 = 126 = 10 \quad 6.$

$9 \text{ yards at } 19 = 171 = 14 \quad 3.$

$10 \text{ yards at } 15 = 150 = 12 \quad 6.$

$10 \text{ yards at } 19 = 190 = 15 \quad 10.$

If the price consists of pence, and one farthing, add $\frac{1}{4}$ of the quantity to the other value. If there be a remainder, it is farthings. When the price is pence and a half-penny, add $\frac{1}{2}$ of the quantity to the other value.

EXAMPLES.

	d.	s.	d.	d.	s.	d.
16 yards at	$2\frac{1}{4}$	=	2	8	+	4 = 3 0.
17 yards at	$3\frac{1}{4}$	=	4	3	+	$4\frac{1}{4}$ = 4 7 $\frac{1}{4}$.
18 yards at	$4\frac{1}{4}$	=	6	0	+	$4\frac{1}{2}$ = 6 4 $\frac{1}{2}$.
7 $\frac{1}{4}$ yds. at	16	=	9	4	+	4 = 9 8.
14 yards at	$7\frac{1}{2}$	=	8	2	+	7 = 8 9.
17 yards at	$9\frac{1}{2}$	=	12	9	+	$8\frac{1}{2}$ = 13 5 $\frac{1}{2}$.
10 $\frac{1}{2}$ yds. at	15	=	12	6	+	$7\frac{1}{2}$ = 13 1 $\frac{1}{2}$.

When

When the price is pence and three farthings, call the price one farthing more. Find the value with this assumed price, and subtract one-fourth of the quantity, as pence, from the other value.

E X A M P L E I.

Required the value of 16 yards at $7\frac{3}{4}d.$ per yard?

Call the price $8d.$ Then $16 \times 8 = 128 = 10s. 8d.$ from which subtract one-fourth of 16, viz. 4; and the answer is, 10s. 4d.

EXAMPLE 2.

Required the value of 14 yards at $8\frac{3}{4}d.$ per yard?

If the price be called $9d.$ it will be $14 \times 9 = 10s. 6d.$ and $14 \div 4 = 3\frac{1}{2}d.$ therefore the answer is $10s. 2\frac{1}{2}d.$

MORE EXAMPLES.

d. *s.* *d.*

18 yards at $2\frac{3}{4} = 4 \ 1\frac{1}{2}.$

4 yards at $17\frac{3}{4} = 5 \ 11.$

8 yards at $14\frac{3}{4} = 9 \ 10.$

SECTION III.

*When the Quantity is any Number under 20,
and the Price any Number of Skillings
under 13:*

*Or when the Quantity is any Number under
13, and the Price any Number of Skillings
under 20.*

R U L E.

THE figure, in the units place of their product, consider as shillings. Half the other part of the product is pounds. If 1 remains, add 10s. to the figure in the units place.

EXAMPLE 1.

Required the value of 16 yards at 8s. ?

The product is 128. One half of 12 is 6 ; therefore the answer is 6l. 8s.

EXAMPLE 2.

Required the value of 18 yards at 12s. ?

Their product is 216. One half of 21 is 10 : the remaining 1, joined to the last figure 6, makes 16s. therefore the value is 10l. 16s.

MORE

MORE EXAMPLES.

$$\begin{array}{r} \text{13 yards at } 8 = 104 = 5 \text{ } 4. \end{array}$$

$$\text{14 yards at } 7 = 98 = 4 \text{ } 18.$$

$$\text{15 yards at } 9 = 135 = 6 \text{ } 15.$$

$$\text{16 yards at } 12 = 192 = 9 \text{ } 12.$$

$$\text{17 yards at } 10 = 170 = 8 \text{ } 16.$$

$$\text{18 yards at } 11 = 198 = 9 \text{ } 18.$$

$$\text{7 yards at } 17 = 119 = 5 \text{ } 19.$$

$$\text{9 yards at } 18 = 162 = 8 \text{ } 2.$$

$$\text{11 yards at } 13 = 143 = 7 \text{ } 3.$$

$$\text{12 yards at } 17 = 204 = 10 \text{ } 4.$$

18. *The Mental Accountant.*

If, besides a number of shillings, the price contains pence—add $\frac{1}{4}$ of the quantity to the value for the shillings, for 6d. Add $\frac{1}{8}$ of the quantity for 4d. &c.

EXAMPLE 1.

Required the value of 16 yards at 11s. 6d.?

The value of 16 yards at 11s. is 8*l.* 16s. to which $\frac{1}{4}$ of 16 being added, the whole is 17*l.* 4s.

EXAMPLE 2.

Required the value of 18 yards at 4s. 2d.?

The value of 18 yards at 4s. is 3*l.* 12s. to which, $\frac{1}{8}$ of 18 being added, the answer is 3*l.* 15s.

MORE

MORE EXAMPLES.

$$\begin{array}{rcll} & s. & d. & \\ 14 \text{ yards at } & 4 & 6 & = 56 + 7 = 3 \quad 3. \end{array}$$

$$16 \text{ yards at } 8 \quad 3 = 128 + 4 = 6 \quad 12.$$

$$15 \text{ yards at } 9 \quad 4 = 135 + 5 = 7 \quad 0.$$

$$8 \text{ yards at } 14 \quad 1\frac{1}{2} = 112 + 1 = 5 \quad 13.$$

$$6 \text{ yards at } 15 \quad 2 = 90 + 1 = 4 \quad 11.$$

But it is generally the best way, when the price consists of shillings and pence, to find the value for the shillings by this Section; the value for the pence by Section II. and adding them.

EXAMPLE I.

Required the value of 16 yards at 4s.
7d.?

16 at 4s. come to 3*l.* 4s. and 16 yards at
7d. come to 9s. 4d. therefore the answer is
3*l.* 13s. 4d.

 MORE EXAMPLES.

yds.	s.	d.	l.	s.	s.	d.	l.	s.	d.
14 at	8	5	=	5	12	+ 5	10	=	5 17 10.
17 at	12	3	=	10	4	+ 4	3	=	10 8 3.
18 at	5	2½	=	4	10	+ 3	9	=	4 13 9.

When

When the price is within 1*d.* or 2*d.* of shillings, find the value for the nearest shillings, and subtract for the difference.

EXAMPLE 1.

Required the value of 16 yards at 5*s.* 11*d.*?

16 yards at 6*s.* come to 4*l.* 16*s.* from which 1*s.* 4*d.* being taken, the remainder is 4*l.* 14*s.* 8*d.*

EXAMPLE 2.

Required the value of 18 yards at 8*s.* 11½*d.*?

18 yards

18 yards at 9s. come to 8l. 2s. from which 9d. being taken, the remainder is 8l. 1s. 3d.

MORE EXAMPLES.

	s.	d.	l.	s.	s.	d.	l.	s.	d.
10 yards at 15	10	=	8	0	—	1	8	=	7 18 4.
13 yards at 11	11	=	7	16	—	1	1	=	7 14 11.
15 yards at 2	10	=	2	5	—	2	6	=	2 6.



SECTION IV.

When the Price is near to one Pound.

R U L E.

LET the quantity stand for the answer in pounds; and add or subtract for the value of the excess or defect.

EXAMPLE I.

Required the value of 67 yards at 1*l.* 0*s.* 1*d.*?

67 yards at 1*l.* come to 67*l.* and 67 at 1*d.* come to 5*s.* 7*d.* therefore the answer is 67*l.* 5*s.* 7*d.*

EXAMPLE 2.

Required the value of 72 yards at 19s.
11 $\frac{3}{4}$ d.

72 yards at 1l. come to 72l. But that is
1 farthing too much per yard; therefore
72 farthings = 1s. 6d. must be deducted:
hence the answer is 71l. 18s. 6d.

MORE EXAMPLES.

	l.	s.	d.	d.	s.	d.
324 yards at 1 0 6	=	332	10	0.		
56 yards at 1 0 0 $\frac{1}{4}$	=	56	2	4.		
92 yards at 1 0 0 $\frac{1}{4}$	=	92	1	11.		
160 yards at 1 0 2	=	161	6	8.		
240 yards at 1 0 3	=	243	0	0.		

SECTION V.

*To find the Value of any Quantity of Goods,
when the Price is nearly an aliquot Part of a
Pound.*

R U L E.

FIND the value for the aliquot part, by the common rule of practice. The value of the difference between the two prices will be known by Pence Table. To be added, to the value already found, if the price be greater than the aliquot one; but subtracted when lesser.

EXAMPLE 1.

Required the value of 216 yards at 10s. 1d. per yard?

It is easy to divide 216 mentally by 2, which gives 108l. and, at the same instant, to know that 216d. make 18s. and that therefore 216 yards at 10s. 1d. come to 108l. 18s.

EXAMPLE 2.

Required the value of 228 yards at 6l. 9d.?

$228 \div 3 = 76$ l. and $228d. = 19$ s. therefore the answer is 76l. 19s.

EXAMPLE 3.

Required the value of 400 yards at 5s.
1d.?

$400 \div 4 = 100l.$ and $400d. = 1l. 13s. 4d.$
therefore the answer is 101l. 13s. 4d.

EXAMPLE 4.

Required the value of 300 yards at 4s.
 $0\frac{1}{2}d.$?

$300 \div 5 = 60l.$ and 300 at $\frac{1}{2}d. = 150l. =$
12s. 6d. therefore the answer is 60l. 12s. 6d.

EXAMPLE 5.

Required the value of 136 yards at 3s.
 $4\frac{1}{4}d.$?

38 *The Mental Accountant.*

$136 \div 6 = 22l. 13s. 4d.$ and $136qrs. = 34d.$
 $= 2s. 10d.$ therefore the answer is $22l. 16s.$
 $2d.$

EXAMPLE 6.

Required the value of 57 yards at $2l. 7s. ?$

$57 \div 8 = 7l. 2s. 6d.$ and $57d. = 4s. 9d.$
therefore the answer is $7l. 7s. 3d.$

EXAMPLE 7.

Required the value of 34 yards at $2s.$
 $0\frac{1}{2}d. ?$

$34 \div 10 = 3l. 8s.$ and $34 \text{ at } \frac{1}{2}d. = 17d. =$
 $1s. 5d.$ therefore the answer is $3l. 9s. 5d.$

EX-

EXAMPLE 8.

Required the value of 84 yards at 1s. 8½d.?

$84 \div 12 = 7l.$ and 84 at ½d. = 42d. = 3s. 6d. therefore the answer is 7l. 3s. 6d.

EXAMPLE 9.

Required the value of 429 yards at 1s. 1d.?

$429 \div 20 = 21l. 9s.$ and 429 at 1d. = 1l. 15s. 9d. hence the answer is 23l. 4s. 9d.

EXAMPLE 10.

Required the value of 260 yards at 9s. 11d. per yard?

$260 \div 2 = 130l.$ and 260 at $1d. = 1l. 1s. 8d.$ which taken from $130l.$ leaves $128l. 18s. 4d.$ for the answer.

EXAMPLE 11.

Required the value of 384 yards at $6s. 7\frac{1}{2}d. ?$

$384 \div 3 = 128l.$ and 384 at $\frac{1}{2}d. = 192d. = 16s.$ which taken from $128l.$ leaves $127l. 4s.$ for the answer.

EXAMPLE 12.

Required the value of 64 yards at $5s. 2d. ?$

$64 \div 4 = 16$, and twice $5s. 4d.$ is $10s. 8d.$ therefore the answer is $16l. 10s. 8d.$

EXAMPLE 13.

Required the value of 360 yards at 2s.
2d.?

$360 \div 10 = 36l.$ and twice $1l. 10s. = 3l.$
therefore the answer is $39l.$

MORE EXAMPLES.

$s. \quad d. \quad l. \quad s. \quad d.$
88 yards at $10 \ 0\frac{1}{4} = 44 \quad 1 \ 10.$

74 yards at $6 \ 7\frac{1}{4} = 24 \ 11 \ 9\frac{1}{2}.$

204 yards at $5 \ 0\frac{1}{4} = 51 \ 4 \ 3.$



SECTION VI.

When the Price is an aliquot Part of a Guinea.

R U L E.

DIVIDE the quantity by the aliquot part, and the divisor is the answer in guineas, which is most readily turned into pounds. When there is a remainder, multiply it into the price.

EXAMPLE I.

Required the value of 128 yards at 10s.
6d.?

$128 \div 2 = 64$ guineas $= 67l. 4s.$ the answer.

EXAMPLE 2.

Required the value of 147 gallons at 7s.?

$147 \div 3 = 49$ guineas $= 51l. 9s.$ the answer.

MORE EXAMPLES.

yds.	s. d.		l. s. d.
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48 at 5 3	$= 12$ guineas	$= 12$	12 0.
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76 at 3 6	$= 12$ gs. and 14s.	$= 13$	6 0.
-----------	---------------------	--------	------

154 at 3 0	$= 22$ guineas	$= 23$	2 0.
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MORE EXAMPLES.

	s.	d.	grs.	s.	d.	l.	s.	d.
39 yds. at 6	11	= 13	- 3	3	= 13	9	9.	
16 yds. at 5	2	= 4	- 1	4	= 4	2	8.	
36 yds. at 3	6½	= 6	+ 1	6	= 6	7	6.	
56 yds. at 2	11	= 8	- 4	8	= 8	3	4.	
24 yds. at 2	8½	= 3	+ 2	0	= 3	5	0.	
27 yds. at 2	3½	= 3	- 1	1½	= 3	1	10½.	
48 yds. at 1	9½	= 4	+ 2	0	= 4	6	0.	



S E C T I O N VII.

When the Price is nearly One Shilling.

R U L E.

LET the quantity stand for the answer in pence; and add or subtract for the difference.

E X A M P L E I.

Required the value of 36 yards at 1s. 1d.?

36 yards at 1s. is 1l. 16s. to which add 36d. = 3s. being added, the amount is 1l. 19s.

M O R E

MORE EXAMPLES.

yds. s. d. l. s. s. d. l. s. d.

$$48 \text{ at } 1 \quad 1 = 2 \quad 8 + 4 \quad 0 = 2 \quad 12 \quad 0.$$

$$32 \text{ at } 1 \quad 0\frac{1}{2} = 1 \quad 12 + 1 \quad 4 = 1 \quad 13 \quad 4.$$

$$40 \text{ at } 1 \quad 2 = 2 \quad 0 + 6 \quad 8 = 2 \quad 6 \quad 8.$$

$$126 \text{ at } 1 \quad 1 = 6 \quad 6 + 10 \quad 6 = 6 \quad 16 \quad 6.$$

$$19 \text{ at } 1 \quad 0\frac{1}{2} = 0 \quad 19 + 0 \quad 9\frac{1}{2} = 0 \quad 19 \quad 9\frac{1}{2}.$$

$$210 \text{ at } 0 \quad 11 = 10 \quad 10 - 17 \quad 6 = 9 \quad 12 \quad 6.$$

$$424 \text{ at } 0 \quad 11\frac{1}{2} = 21 \quad 4 - 17 \quad 8 = 20 \quad 6 \quad 4.$$

$$138 \text{ at } 0 \quad 11\frac{3}{4} = 6 \quad 18 - 2 \quad 10\frac{1}{2} = 6 \quad 15 \quad 1\frac{1}{2}.$$

$$14 \text{ at } 0 \quad 10 = 0 \quad 14 - 2 \quad 4 = 0 \quad 11 \quad 8.$$

$$92 \text{ at } 0 \quad 10 = 4 \quad 12 - 15 \quad 4 = 3 \quad 16 \quad 8.$$

SECTION VIII.

When the Quantity is 12.

R U L E.

THE answer will be as many shillings, as the price consists of pence. If 24, twice as many; if 36, thrice as many, &c.

E X A M P L E S.

	s.	d.	=	s.	d.	=	l.	s.	d.
12 yards at	6	4	=	76		=	3	16	0.

12 yards at	14	3	=	171		=	8	11	0.
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12 yards at	8	$4\frac{1}{2}$	=	100 6		=	5	0	6.
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24 yards

	<i>s.</i>	<i>d.</i>		<i>d.</i>		<i>l.</i>	<i>s.</i>	<i>d.</i>
24 yards at	3	9	=	45	×	2	=	4 10 0.
24 yards at	11	2	=	134	×	2	=	13 8 0.
24 yards at	4	$1\frac{1}{2}$	=	$49\frac{1}{2}$	×	2	=	4 19 0.
36 yards at	2	4	=	28	×	3	=	4 4 0.
36 yards at	7	6	=	90	×	3	=	13 10 0.
36 yards at	4	$2\frac{1}{2}$	=	$50\frac{1}{2}$	×	3	=	7 11 6.
132 yards at	6	7	=	79	×	11	=	43 9 0.
132 yards at	2	8	=	32	×	11	=	17 12 0.
144 yards at	4	3	=	51	×	12	=	30 12 0.
144 yards at	7	4	=	88	×	12	=	52 16 0.
144 yards at	2	3	=	27	×	12	=	16 4 0.

If the number of yards be not exactly a multiple of 12, find the value of the nearest number that is a multiple of 12; and add or subtract for the value of the difference.

EXAMPLE 1.

Required the value of 122 yards at 3s. 1d.?

In this Example, 120 is the nearest; therefore $37 \times 10 = 18\text{ }l. 10\text{ }s.$ and 2 yards are 6s. 2d. hence 18l. 16s. 2d. is the answer.

MORE

MORE EXAMPLES.

yds.	s.	d.	l.	s.	s.	d.	l.	s.	d.
50 at 2	3	=1	7	$\times 4, + 4$	6	=	5	12	6.
61 at 1	7	=0	19	$\times 5, + 1$	7	=	4	16	7.
25 at 2	10	=1	14	$\times 2, + 2$	10	=	3	10	10.
49 at 4	6	=2	14	$\times 4, + 4$	6	=11	0		6.
59 at 6	6	=3	18	$\times 5, - 6$	4	=19	3		8.
74 at 2	7	=1	11	$\times 6, + 5$	2	=	9	11	2.
85 at 5	10	=3	10	$\times 7, + 5$	10	=24	15		10.
143 at 1	9	=1	1	$\times 12 - 1$	9	=12	10		3.



SECTION IX.

When the Quantity is 20.

R U L E.

THE shillings of the price is the answer in pounds. If there be 6*d.* in the price, besides the shillings, add 1*os.* and, if 3*d.* add 5. But, if there be any other number of pence, multiply by 20, and the knowledge of the Pence Table will instantly determine the value.

EXAMPLES.

s. d. l. s. d.

$$20 \text{ at } 4 \text{ } 6 = 4 \text{ } 10 \text{ } 0.$$

$$20 \text{ at } 7 \text{ } 3 = 7 \text{ } 5 \text{ } 0.$$

$$20 \text{ at } 3 \text{ } 5 = 3 \text{ } 8 \text{ } 4.$$

$$20 \text{ at } 12 \text{ } 7 = 12 \text{ } 11 \text{ } 8.$$

l. s. d. l. s. d.

$$23 \text{ at } 9 \text{ } 2 = 9 \text{ } 3 \text{ } 4 + 1 \text{ } 7 \text{ } 6 = 10 \text{ } 10 \text{ } 10.$$

$$21 \text{ at } 8 \text{ } 4 = 8 \text{ } 6 \text{ } 8 + 0 \text{ } 8 \text{ } 4 = 8 \text{ } 15 \text{ } 0.$$

If the quantity be 40, 60, 80, &c. multiply the value of 20 by 2, 3, 4, &c.

EXAMPLES.

Yds.	s.	d.	l.	s.	d.	l.	s.	d.
------	----	----	----	----	----	----	----	----

40 at	6	4 =	6	6	8 × 2 =	12	13	4.
-------	---	-----	---	---	---------	----	----	----

40 at	7	10 =	7	16	8 × 2 =	15	13	4.
-------	---	------	---	----	---------	----	----	----

60 at	5	6 =	5	10	0 × 3 =	16	10	0.
-------	---	-----	---	----	---------	----	----	----

80 at	7	2 =	7	3	4 × 4 =	28	13	4.
-------	---	-----	---	---	---------	----	----	----

100 at	14	6 =	14	10	0 × 5 =	72	10	0.
--------	----	-----	----	----	---------	----	----	----

120 at	9	2 =	9	3	4 × 6 =	55	0	0.
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SECTION X.

When the Value of a Quantity of Goods, at a given Price, is known; the Value of two, three, or four times the Quantity is found by multiplying the known Value by 2, 3, 4, &c.

Or when the Value of a Quantity, at a given Price, is known; the Value of the same Quantity at two, three, or four times the Price is found by multiplying the known Value by 2, 3, 4, &c.

EXAMPLE I.

A Linen-draper, making out his bill,
has 18 yards of cotton at 2s. 4d. per yard,
in

in it ; which, while he is writing the line, he mentally knows to be 2*l*. In another line he has 72 yards of linen at 2*s*. 4*d*. whose value he immediately knows to be 8*s*. For $72 \div 18 = 4$, and $4 \times 2 = 8$ *l*.

EXAMPLE 2.

One article being 11 yards, at 4*s*. 4*d*. the value is 2*l*. 7*s*. 8*d*. hence the value of 88 yards, at 4*s*. 4*d*. is readily found to be 19*l*. 1*s*. 4*d*.

EXAMPLE 3.

The value of 14 yards, at 2*s*. 3*d*. is 1*l*. 1*s*. 6*d*. Hence 14 yards, at 6*s*. 9*d*. come to 4*l*. 14*s*. 6*d*.

EXAMPLE 4.

The value of 22 yards, at 4*s.* 1*d.* is 4*l.* 9*s.* 10*d.* hence 22 yards, at 16*s.* 4*d.* come to 17*l.* 19*s.* 4*d.*

EXAMPLE 5.

The value of 8 yards, at 10*s.* 3*d.* is 4*l.* 2*s.* hence 42 yards, at 10*s.* 3*d.* come to 21*l.* 10*s.* 6*d.* For 40 yards, viz. 8×5 , come to 20*l.* 10*s.* to which 1*l.* 0*s.* 6*d.* the value of 2 yards, being added, the answer is 21*l.* 10*s.* 6*d.*



SECTION XI.

Contractions in Loss and Gain.

R U L E.

IF the proportion between the prime cost and the gain is expressed by a whole number, divide 100*l.* by that number; the quotient will be the gain *per cent.*

E X A M P L E I.

When wine is bought at 7*s.* 6*d.* per gallon, and sold for 10*s.* how much is the gain *per cent.*?

The

The prime cost, in this example, is three times the gain; therefore $100 \div 3 = 33\text{ l. } 6\text{ s. } 8\text{ d. gain per cent.}$

EXAMPLE 2.

When tea is bought at $6\text{ s. } 8\text{ d.}$ per lb. and sold at $7\text{ s. } 4\text{ d.}$ the prime cost is ten times the gain, hence $100\text{ l.} \div 10 = 10\text{ l.}$ the gain *per cent.*

EXAMPLE 3.

If cotton be bought at $2\text{ s. } 6\text{ d.}$ per yard, and sold at $2\text{ s. } 8\text{ d.}$ the prime cost is 15 times the gain; therefore $100 \div 15 = 6\text{ l. } 13\text{ s. } 4\text{ d.}$

When

When the gain *per cent.* is determined on, and the selling price wanted, increase the prime cost by such a part of itself, as gain is of 100*l.*

EXAMPLE I.

Bought muslin at 4*s.* 8*d.* per yard : how must it be sold to gain $12\frac{1}{4}\%$ *per cent.* ?

In 100*l.* the gain 12*l.* 10*s.* is contained 8 times, \therefore to 4*s.* 8*d.* add one-eighth of itself, viz. 7*d.* and the selling price will be 5*s.* 3*d.*

EXAMPLE 2.

Bought cheese at 2s. 4d. per hundred weight :—How must it be sold to gain 6l. 5s. per cent.?

The proportion is 16, and $2l. 4s. \div 16 = 2s. 9d.$ Hence the selling price must be 2l. 6s. 9d.

The following Table contains all the aliquot Parts of 100l. from the One-Third to the Twentieth, and, when committed to Memory, will immediately solve any Question in Loss and Gain.

F

TABLE.

T A B L E

L.	S.	D.	Part.
33	6	8	3
25	12	4	4
20	0	0	5
16	13	4	6
12	10	0	8
10	0	0	10
8	6	8	12
6	13	4	15
6	5	0	16
5	0	0	20

The application of the Table is obvious.
 If the prime cost is 6 times the gain; then
 the gain *per cent.* is 16 $\frac{1}{2}$ 13s. 4d.

On the other hand, if the gain *per cent.*
 be fixed at 5 $\frac{1}{2}$ l. then the prime cost must be
 increased by one-twentieth of itself.

SECTION XII.

Contractions in Proportion.

WHEN the first and third terms, or the first and second terms, are both divisible by the same number, it shortens the operation much, when that division is actually made.

EXAMPLE I.

When 66 yards cost 45*l.* how much will 55 yards come to?

The first and third terms are divisible by 11—Therefore 6..45::5..37*l.* 10*s.* the answer.

EXAMPLE 2.

When 24 yards cost 15*l*. how much will
84 yards come to?

The first and third terms are divisible by
12.—Therefore, as 2::15*l*::17*l*. 5*s*. 10*d*.

EXAMPLE 3.

When 64 yards cost 48*l*. how much will
51 yards cost?

The first and second are divisible by 16
—Therefore 4::3::51::38*l*. 5*s*.

EXAMPLE 4.

When 45 yards cost 15*l*. how much will
96 yards come to ?

THE SOLUTION.

The first and second are divisible by 15

—Therefore $96 \div 15 = 6 \frac{4}{5}$ Or $96 \div 3 = 32$

32*l*.

EXAMPLE 5.

The first and second are divisible by 15

—Therefore $96 \div 15 = 6 \frac{4}{5}$ Or $96 \div 3 = 32$

32*l*.

EXAMPLE 6.

The first and second are divisible by 15

—Therefore $96 \div 15 = 6 \frac{4}{5}$ Or $96 \div 3 = 32$

32*l*.

EXAMPLE 7.

The first and second are divisible by 15

—Therefore $96 \div 15 = 6 \frac{4}{5}$ Or $96 \div 3 = 32$

32*l*.

EXAMPLE 8.

The first and second are divisible by 15

—Therefore $96 \div 15 = 6 \frac{4}{5}$ Or $96 \div 3 = 32$

32*l*.

E X A M P L E S

The following Examples are taken from the

SOLUTIONS

SECTION XIII.

The following Examples are taken from the

SOLUTIONS

AMONGST the following Examples, there are several which are not similar to any in the preceding Sections. Such as those where the quantity is 240, 242, 480, 483, 252, &c. It is necessary to observe, therefore, that when the quantity is 240, the answer is as many pounds, as the price consists of pence. When the quantity is 252, the answer will be as many guineas, as there are pence in the price.

The first eight of the Examples following correspond respectively with the second

and

and seven following Sections. Afterwards they are given promiscuously. The Scholar must, from the attention he has given, adopt the most proper rules about 10

$$10 \text{ } 4 \text{ } 4 = 17 \text{ } 2 \text{ } 2 \text{ } 2 \text{ } 2 \text{ } 2$$

$$10 \text{ } 11 \text{ } 10 = 11 \text{ } 11 \text{ } 11 \text{ } 11 \text{ } 11$$

$$10 \text{ } 0 \text{ } 4 \text{ } 11 \text{ } 2 \text{ } 11 \text{ } 2 \text{ } 11 \text{ } 2$$

$$18 \text{ yards at } 0 \text{ } 9 = 0 \text{ } 13 \text{ } 6.$$

$$10 \text{ } 0 \text{ } 7 = 0 \text{ } 7 \text{ } 11 \text{ } 11 \text{ } 11$$

$$13 \text{ yards at } 7 \text{ } 0 = 4 \text{ } 11 \text{ } 0.$$

$$10 \text{ } 0 \text{ } 12 = 0 \text{ } 12 \text{ } 11 \text{ } 11 \text{ } 11$$

$$140 \text{ yards at } 19 \text{ } 11 \frac{1}{2} = 139 \text{ } 14 \text{ } 2.$$

$$340 \text{ yards at } 3 \text{ } 11 \frac{1}{4} = 67 \text{ } 12 \text{ } 11.$$

$$288 \text{ yards at } 3 \text{ } 6 = 50 \text{ } 18 \text{ } 0.$$

$$160 \text{ yards at } 1 \text{ } 1 = 8 \text{ } 13 \text{ } 4.$$

$$92 \text{ yards at } 13 \text{ } 10 = 13 \text{ } 8 \text{ } 6 \text{ } 0.$$

$$20 \text{ yards at } 7 \text{ } 6 = 12 \text{ } 10 \text{ } 10.$$

48 yards at $3 \frac{5}{8} = 161 \frac{1}{2}$ 0.

62 yards at $4 \frac{1}{8} = 252 \frac{1}{2}$ 0.

32 yards at $2 \frac{7}{8} = 84 \frac{1}{2}$ 0.

84 yards at $1 \frac{1}{3} = 112 \frac{1}{2}$ 0.

32 yards at $7 \frac{1}{2} = 240 \frac{1}{2}$ 0.

240 yards at $5 \frac{1}{9} = 70 \frac{1}{3}$ 0.

240 yards at $4 \frac{3}{8} = 51 \frac{1}{4}$ 0.

480 yards at $8 \frac{1}{4} = 200 \frac{1}{2}$ 0.

242 yards at $2 \frac{3}{8} = 27 \frac{1}{4}$ 0.

244 yards at $4 \frac{1}{4} = 52 \frac{1}{2}$ 0.

252 yards at $2 \frac{1}{8} = 28 \frac{1}{4}$ 0.

252 yards at $8 \frac{1}{8} = 8 \frac{1}{8}$ 0.

504 yards

	s.	d.	l.	s.	d.
504 yards at 0 5 =	10	10	0	0	0
504 yards at 2 2 =	54	12	0	0	0
16 yards at 0 3 1/4 =	0	4	4		
160 yards at 0 3 1/4 =	2	3	4		
25 yards at 10 2 =	12	14	2		
112 yards at 19 6 =	109	4	0		
63 yards at 10 6 =	33	1	6		
40 yards at 14 0 =	28	0	0		
320 yards at 19 11 1/2 =	319	6	8		
72 yards at 5 0 4 =	18	18	4		
259 yards at 4 11 =	48	15	11		
51 yards at 6 7 =	16	15	9		
88 yards at 5 0 1/4 =	22	13	8		

17 yards

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.

12 yards at 2 2 = 10 2 10 10

13 yards at 2 3 = 10 2 10 10

24 yards at 1 2 = 12 2 12 12

66 yards at 3 6 = 11 11 0.

56 yards at 5 2 1/2 = 14 12 10.

14 yards at 4 5 = 3 1 10.

28 yards at 4 5 = 6 3 8.

28 yards at 8 10 = 12 7 4.

13 yards at 3 7 = 12 4 9.

210 yards at 10 12 = 12 12 0.

108 yards at 3 10 12 = 12 12 0.

200 yards at 2 11 = 10 10 0.

21 21 = 7 0 12 12 12

8 8 10 10 10 10 10 10

12 12 12

